

## EDITORIAL STAFF

**Editor:** George D. Lundberg, MD  
**Deputy Editor:** Richard M. Glass, MD  
**Deputy Editor (West):** Drummond Rennie, MD  
**Senior Editors:** Phil B. Fontanarosa, MD, Margaret A. Winker, MD  
**Senior Contributing Editor:** M. Therese Southgate, MD  
**Contributing Editors:** Charles B. Clayman, MD, Helene M. Cole, MD, Thomas B. Cole, MD, MPH, David S. Cooper, MD, David H. Mark, MD, MPH, Harriet S. Meyer, MD, Carin M. Olson, MD, Ronna Henry Siegel, MD, Jeanette M. Smith, MD, Jody W. Zylke, MD  
**Consulting Editors:** Robert A. Clark, MD, Deborah J. Cook, MD  
**Statistical Editor:** Naomi Vaisrub, PhD  
**Associate Senior Editor:** Annette Flanagan  
**Associate Editors:** Charlene Breedlove, Roxanne K. Young  
**Fishbein Fellow:** Thomas C. Jefferson, MD  
**Medical News & Perspectives:** Marsha F. Goldsmith (editor); Charles Marwick, Mike Mitka, Andrew Skolnick, Joan Stephenson, PhD (associate editors); Rebecca Voelker (contributing editor)  
**Assistant Editor:** Juliana M. Walker

## EDITORIAL BOARD

Daniel M. Albert, MD, Madison, Wis  
 Kenneth A. Arndt, MD, Boston, Mass  
 H. David Banta, MD, Amsterdam, the Netherlands  
 Jack D. Barchas, MD, New York, NY  
 Michael Berger, MD, Düsseldorf, Germany  
 Robert J. Blendon, ScD, Boston, Mass  
 Marjorie A. Bowman, MD, MPA, Philadelphia, Pa  
 Iain Chalmers, MBBS, MSc, Oxford, England  
 James E. Dalen, MD, Tucson, Ariz  
 Catherine D. DeAngelis, MD, Baltimore, Md  
 Lois DeBaakey, PhD, Houston, Tex  
 Ronald G. Evens, MD, St Louis, Mo  
 Michael E. Johns, MD, Atlanta, Ga  
 Colin I. Johnston, MB,BS, Melbourne, Australia  
 Donald A. B. Lindberg, MD, Bethesda, Md  
 Hervé Maisonneuve, MD, Paris, France  
 Kenneth D. McClatchey, MD, DDS, Maywood, Ill  
 C. David Naylor, MD, North York, Ontario, Canada  
 Claude H. Organ, Jr, MD, Oakland, Calif  
 Edmund D. Pellegrino, MD, Washington, DC  
 Reed E. Pyritz, MD, PhD, Pittsburgh, Pa  
 Uwe E. Reinhardt, PhD, Princeton, NJ  
 Povl Riis, MD, Copenhagen, Denmark  
 William L. Roper, MD, MPH, Chapel Hill, NC  
 Roger N. Rosenberg, MD, Dallas, Tex  
 Renée Solomon, MD, New York, NY  
 Masaaki Terada, MD, Tokyo, Japan

## INTERNATIONAL ADVISORY COMMITTEE

Bassel Atallah, MD, JAMA—Middle East  
 Mauro Bologna, MD, JAMA—Italy  
 Carlos R. Gherardi, MD, JAMA—Argentina  
 Yuichiro Goto, MD, JAMA—Japan  
 Evin Kantemir, MD, JAMA—Turkey  
 A. J. Khan, SI, FRCP, JAMA—Pakistan  
 Jin-Pok Kim, MD, JAMA—Korea  
 C. R. Kumana, MBBS, JAMA—Southeast Asia  
 Li Chengyi, MD, JAMA—China  
 Alexandra Livaditou, MD, JAMA—Greece  
 Maria S. P. da Silva, MD, JAMA—Brazil  
 Miguel Vilardell Tarres, MD, JAMA—Spain  
 Ivan Vidmar, MD, JAMA—Slovenia  
 Jiří Widimský, MUDr, DrSc, JAMA—Czech/Slovak  
 Alexei Yurenev, MD, JAMA—Russia

JAMA (ISSN 0098-7484) is published weekly by the American Medical Association, except for 4 combined issues in months with 5 Wednesdays. Address: 515 N State St, Chicago, IL 60610.

**SUBSCRIPTION RATES**—The subscription rate for AMA members (\$20 per year) is included in and is not deductible from the annual AMA membership dues. The annual subscription rates for nonmembers are \$145 in the United States and US possessions, \$195 in the Americas, and £125 outside the Americas. The rate for nonmember medical students and resident physicians is \$48 in the United States. The annual institution rates are \$245 in the United States, \$345 in the Americas, and £195 outside the Americas. Address all subscription communications to Subscriber Services Center, American Medical Association, PO Box 10946, Chicago, IL 60610-0946. Phone: (800) 262-2350; fax: (312) 464-5831; e-mail: [ama-subs@ama-assn.org](mailto:ama-subs@ama-assn.org).

**CHANGE OF ADDRESS**—POSTMASTER, send all address changes to: JAMA, The Journal of the American Medical Association, attention: Subscription Department, PO Box 10946, Chicago, IL 60610. Notification of address change must be made at least 6 weeks in advance; include both old and new addresses and a recent mailing label. Periodicals postage paid at Chicago and at additional mailing offices. GST Registration Number: 12622 5556 RT.

JAMA<sup>®</sup> Registered in the US Patent and Trademark Office.

Copyright © 1998 by the American Medical Association



## Original Contributions

### Effect of Computerized Physician Order Entry and a Team Intervention on Prevention of Serious Medication Errors ..... 1311

D. W. Bates, L. L. Leape, D. J. Cullen, N. Laird, L. A. Petersen, J. M. Teich, E. Burdick, M. Hickey, S. Kleefield, B. Shea, M. Vander Vliet, D. L. Seger, Boston, Mass

### A Computer Alert System to Prevent Injury

#### From Adverse Drug Events: Development and

#### Evaluation in a Community Teaching Hospital ..... 1317

R. A. Raschke, B. Gollihare, T. A. Wunderlich, J. R. Guidry, A. I. Leibowitz, J. C. Peirce, L. Lemelson, M. A. Heisler, C. Susong, Phoenix, Ariz

### The Origin, Content, and Workload of E-mail Consultations ..... 1321

S. M. Borowitz, Charlottesville, Va; J. C. Wyatt, London, England

## Special Communications

### Canopy Computing: Using the Web in Clinical Practice ..... 1325

C. J. McDonald, J. M. Overhage, P. R. Dexter, L. Blevins, J. Meeks-Johnson, J. G. Suico, M. C. Tucker, G. Schadow, Indianapolis, Ind

### FluNet as a Tool for Global Monitoring of Influenza on the Web .... 1330

A. Flahault, Paris, France; V. Dias-Ferrao, Geneva, Switzerland; P. Chaberty, Paris, France; K. Esteves, Geneva, Switzerland; A.-J. Valleron, Paris, France; D. Lavanchy, Geneva, Switzerland

## Brief Reports

### Responses to Unsolicited Patient E-mail Requests

#### for Medical Advice on the World Wide Web ..... 1333

G. Eysenbach, T. L. Diepgen, Erlangen, Germany

### Finding and Applying Evidence During Clinical Rounds:

#### The "Evidence Cart" ..... 1336

D. L. Sackett, S. E. Straus, Oxford, England; for Firm A of the Nuffield Department of Medicine

## Reviews

### Effects of Computer-Based Clinical Decision Support Systems on Physician Performance and Patient Outcomes:

#### A Systematic Review ..... 1339

D. L. Hunt, R. B. Haynes, S. E. Hanna, K. Smith, Hamilton, Ontario, Canada

### How Well Do Physicians Use Electronic Information

#### Retrieval Systems? A Framework for Investigation and Systematic Review ..... 1347

W. Hersh, D. H. Hickam, Portland, Ore

## Health Law and Ethics

### On Call and Online: Sociohistorical, Legal, and Ethical

#### Implications of E-mail for the Patient-Physician Relationship ..... 1353

A. R. Spielberg, Boston, Mass

## Editorials

### Clinical Decision Support Systems

#### to Improve Clinical Practice and Quality of Care ..... 1360

D. C. Classen, Salt Lake City, Utah

### Digital Doctoring—Opportunities and Challenges

#### in Electronic Patient-Physician Communication ..... 1361

T. Ferguson, Houston, Tex

### Medical Information on the Internet ..... 1363

P. R. Hubbs, T. C. Rindfleisch, P. Godin, K. L. Melmon, Stanford, Calif

(Table of Contents continued on next page.)

<b>This Week in JAMA</b> .....	1291
<b>The Cover</b> .....	1292
Richard Diebenkorn, <i>Berkeley No. 8</i> D. Flapan	
<b>Abstracts</b> .....	1292 j
<b>A Piece of My Mind</b> .....	1294
The X Factor A. S. Grove	
<b>Medical News &amp; Perspectives</b> .....	1295
Developing Countries Find Telemedicine Forges Links to More Care and Research . . . Physicians Find Teleactivity Hot Near the North Pole . . . Patient Pretenders Weave Tangled "Web" of Deceit	
<b>Health Agencies Update</b> .....	1298
Cholesterol on the Web . . . Biomedical Discoveries . . . Study Recruiting Kids With Asthma . . . Cerebral Palsy Clues . . . Human Genome Project on Fast Track	
<b>From the Centers for Disease Control and Prevention</b> .....	1299
Multistate Outbreak of Hemolysis in Hemodialysis Patients—Nebraska and Maryland, 1998 . . . Statewide Surveillance for Ehrlichiosis—Connecticut and New York, 1994-1997	
<b>Contempo 1998</b> .....	1303
Medicine and Health on the Internet: The Good, the Bad, and the Ugly D. A. B. Lindberg, B. L. Humphreys	
<b>Poetry and Medicine</b> .....	1304 g
<b>JAMA 100 Years Ago</b> .....	1304 m
<b>Letters</b> .....	1305
Computer Support for Elderly Women With Breast Cancer D. H. Gustafson, F. McTavish, R. Hawkins, S. Pingree, N. Arora, J. Mendenhall, G. E. Simmons	
Telemedicine: Low-Bandwidth Applications for Intermittent Health Services in Remote Areas L. R. Otake, J. G. Thomson, J. A. Persing, R. C. Merrell	
Use of Internet Technology by Obstetricians and Family Physicians D. R. Eitel, J. Yankowitz, J. W. Ely	
Applicability and Quality of Information for Answering Clinical Questions on the Web W. R. Hersh, P. N. Gorman, L. S. Sacherek	
Report of Randomized Controlled Trials Identified in the Chinese Literature vs MEDLINE M. Liu, C. Counsell, P. Sandercock	
Accessing the Internet for Patient Information About Orthopedics S. Rose, J. Bruce, N. Maffulli	
Use and Benefits of a Web Site for Pancreatic Cancer M. Goggins, A. Lietman, R. E. Miller, C. J. Yeo, E. Jaffee, J. Coleman, S. O'Reilly, B. Cullen, J. L. Cameron, S. E. Kern, R. H. Hruban	
Clinic-Based Health Information Web Site for International Travelers J. C. Licciardone, K. M. Herron, A. J. Clark, D. Squires	
<b>JAMA NetSight: A Guide to Interactive Medicine</b> .....	1365
Building Your Own: A Physician's Guide to Creating a Web Site R. Peters, R. Sikorski	
<b>Books, Journals, New Media</b> .....	1367
Guide to Medical Informatics, the Internet, and Telemedicine (Coiera) Reviewed by K. I. Jantunen	
Harrison's 14 CD-ROM: Principles of Internal Medicine, 14th Edition (Fauci et al, eds) Reviewed by P. Taylor	
Cecil Textbook of Medicine (CD-ROM) (Bennett, Plum, eds) Reviewed by E. Bernicker	
Asthma Explored (CD-ROM) Reviewed by R. J. Bonforte	
The Internet in Medicine (CD-ROM) (Arvanitis, ed) Reviewed by J. M. Lamiell	
Dragon NaturallySpeaking (Voice Recognition Software) Reviewed by R. Hogan	
<b>Policy Perspectives</b> .....	1371
Access to Health Information and Support: A Public Highway or a Private Road? T. R. Eng, A. Maxfield, K. Patrick, M. J. Deering, S. C. Ratzan, D. H. Gustafson	
<b>Obituary Listing</b> .....	1376 e
<b>Classified Advertising and Announcements</b> .....	1379 a
<b>Index to Advertisers</b> .....	1379 p
<b>JAMA Patient Page: Health and the Internet</b> .....	1380
<b>JAMA Instructions for Authors</b> .....	See July 1, 1998, p 19.
<b>JAMA Reader's Choice: Continuing Medical Education</b> ....	1377

# JAMA®

The Journal of the American Medical Association

## SCIENTIFIC INFORMATION AND MULTIMEDIA STAFF

**Medical News and New Media Division:** William M. Silberg (editorial director); Renée Roberts (manager, editorial graphics); Marty Suter (associate editor); Deborah Flapan, Neal Shankman (assistant editors); Marla A. Hall (staff assistant)

**Editorial Systems and Administration:** Elaine Williams (director), Vee Bailey (electronic input supervisor), Celina Canchola, Lenette Gardner-Gullens (electronic input specialists)

**Staff Assistant:** Helga Fritz

**Editorial Assistants:** Linda Baker, Patricia Joworski, Gale Saulsbery (group supervisors); Kemberly Evans (letters coordinator); Mary Cannon, Susan Collier, Audrey Forman, Shirley Gogins, Gwenn Gregg, Lisa Hardin, Carmina Landeros, Mary Ann Lilly, Christina Myers, Kathie Owens, Ethel Pinkston, Jeni Reiling, Raul Serrato, Gloria Tate

**Editorial Processing Division:** Cheryl Iverson (director), Diane L. Cannon (freelance manager), Connie Manno (freelance coordinator), Paul Frank (electronic editing specialist), Monica Mungle (assistant electronic editing specialist)

**Copy Editing:** Laura King (director); Susan R. Benner, Jane C. Lantz (senior copy editors); Coleen Adamson, Joy Jaeger, Brande Martin, Beverly Stewart

## PRODUCTION AND DISTRIBUTION STAFF

**Production and Distribution Division:** Vanessa Hayden (director), Diane Darnell (publishing manufacturing analyst), Bonnie Van Clevon (manager, budgets and costs), Karen Adams-Taylor (director, advertising and production), Linda Knott (director, electronic production), Paul Gasiecki (manager, distribution), Debbie Camp (production services supervisor), Betty Frigerio (production services supervisor), Terri Hanley (production specialist)

**Managers:** Phil Arko (composition), Mary Ellen Johnston (database and new media), Teresa Omitek (proofreading), Carole Piszker (advertising), Susan Price (print production), Charl Richey (color and graphics)

**Proofreaders:** David Antos, Daniel James, Mary Kay Tinerella, Barbara Wojtowicz

**Production Associates and Operators:** Joseph Amft, Gail Barrett, Karen Branham, Victoria Buckner, Brenda Chandler, La'son J. Diggs, Shannon Epplert, Amy Evers, Kathy Gaydar, Mari Guizzetti, Maria Kowalkowski, Mary Ann Kuranda, Sandra Lopez, Michael McGraw, Melanie Parenti, Sarah Powell, Jo Anne Turner, Carmela Ware, JoAnne Weiskopf, Alicja Wojcik-Dunn

**Production Assistants:** Bryan Irzyk, Ruth Sprague

## CIRCULATION AND CONTENT MARKETING STAFF

**Director, Division of Circulation and Content Marketing:**

James A. Skowronski

**Circulation Processing:** Beverly Martin (director)

**Circulation Development:** Bina Oza (director)

**Licensing and Permissions:** Norman Frankel (director), Ada Jiminez-Walker (permissions)

**Reprint Coordinator:** Joseph Reakash

## AMA Officers

**President:** Nancy W. Dickey, MD\*

**President-Elect:** Thomas R. Reardon, MD\*

**Immediate Past President:** Percy Wootton, MD

**Secretary-Treasurer:** Timothy T. Flaherty, MD\*

**Speaker, House of Delegates:** Richard F. Corlin, MD

**Vice-Speaker, House of Delegates:** John A. Knote, MD

## AMA Trustees

Herman I. Abramowitz, MD; Susan Hershberg Adelman, MD; Yank D. Coble, MD\*; Palma E. Formica, MD; J. Edward Hill, MD; Donald T. Lewers, MD\* (Vice Chair); William H. Mahood, MD; John C. Nelson, MD\*; Donald J. Palmisano, MD, JD; William G. Pledsted III, MD; Bruce A. Scott, MD (Young Physician); Randolph D. Smock, Jr, MD\* (Chair); Andrew M. Thomas, MD (Resident); Jeffrey A. Towson (Student). \*Executive Committee.

## AMA EXECUTIVE STAFF

**Executive Vice President, Chief Executive Officer:**

E. Ratcliffe Anderson, Jr, MD

**Chief Operating Officer:** Lynn Jensen, PhD

**Editor in Chief, Scientific Information and Multimedia:**

George D. Lundberg, MD

**Interim Senior Vice President, Publishing & Business:**

Robert L. Kennett

**Publisher:** Peter J. Murphy

**Director of Advertising Sales:** Stuart H. Williams

**ADVERTISING OFFICES—Eastern:** 119 Cherry Hill Rd, 3rd Floor, Parsippany, NJ 07054 (Representatives: Susan J. Carollo, Alice H. Herman [973-263-9191]); **Midwest/Farwest:** 515 N State St, Chicago, IL 60610 (Representative: Jeffrey J. Bonistalli [312-464-2551]); **Classified Advertising:** 312-464-2456

**ADVERTISING PRINCIPLES—**Advertisements in this issue have been reviewed to comply with the principles governing advertising in AMA publications. A copy of these principles is available on request. The appearance of advertising in AMA publications is not an AMA guarantee or endorsement of the product or the claims made for the product by the manufacturer.

**MANUSCRIPT SUBMISSION—**Send manuscripts to the Editor, George D. Lundberg, MD, JAMA, 515 N State St, Chicago, IL 60610.

All articles published, including editorials, letters, and book reviews, represent the opinions of the authors and do not reflect the official policy of the American Medical Association or the institution with which the author is affiliated, unless this is clearly specified.