



ANESTHESIOLOGY

The Journal of the American Society of Anesthesiologists, Inc. • anesthesiology.org

Mission: Promoting scientific discovery and knowledge in perioperative, critical care, and pain medicine to advance patient care.

EDITOR-IN-CHIEF

Evan D. Kharasch, M.D., Ph.D.
Editor-in-Chief, ANESTHESIOLOGY
Department of Anesthesiology
Washington University in St. Louis
St. Louis, Missouri
Tel: 1-800-260-5631
E-mail: editorial-office@anesthesiology.org

PAST EDITORS-IN-CHIEF, ANESTHESIOLOGY

Henry S. Ruth, M.D., 1940–1955
Ralph M. Tovell, M.D., 1956–1958
James E. Eckenhoff, M.D., 1959–1962
Leroy D. Vandam, M.D., 1963–1970
Arthur S. Keats, M.D., 1971–1973
Nicholas M. Greene, M.D., 1974–1976
C. Philip Larson, Jr., M.D., 1977–1979
John D. Michenfelder, M.D., 1980–1985
Lawrence J. Saidman, M.D., 1986–1996
Michael M. Todd, M.D., 1997–2006
James C. Eisenach, M.D., 2007–2016

COVER ART

James P. Rathmell, M.D.
Boston, Massachusetts
Annemarie B. Johnson, C.M.I.
Medical Illustrator
Winston-Salem, North Carolina

CME EDITORS

Leslie C. Jameson, M.D.
Dan J. Kopacz, M.D.

EDITORIAL OFFICE

Vicki Tedeschi, Managing Editor
E-mail: managing-editor@anesthesiology.org
Allison Akeley
Alice Landwehr
Karen Parks
Meg Weist
ANESTHESIOLOGY Journal
1061 American Lane
Schaumburg, IL 60173-4973
Tel: 1-800-260-5631
E-mail: editorial-office@anesthesiology.org

WOLTERS KLUWER HEALTH PUBLICATION STAFF

Miranda Walker, Publisher
Sara Cleary, Senior Journal Production Editor
Emily Moore, Journal Production Editor
Colette Lind, Journal Production Associate
Hilary Druker, Advertising Field Sales Representative
Joe Anzuena, Classified Advertising Representative
Silvia Serra, Director, Rights, Licensing & Permissions

ASA OFFICERS

Jeffrey Plagenhoef, M.D., President
James D. Grant, M.D., M.B.A., President-Elect
Daniel J. Cole, M.D., Immediate Past President
Linda J. Mason, M.D., First Vice-President

All articles accepted for publication are done so with the understanding that they are contributed exclusively to this Journal and become the property of the American Society of Anesthesiologists, Inc. Statements or opinions expressed in the Journal reflect the views of the author(s) and do not represent official policy of the American Society of Anesthesiologists unless so stated.



ANESTHESIOLOGY

The Journal of the American Society of Anesthesiologists, Inc. • anesthesiology.org

Mission: Promoting scientific discovery and knowledge in perioperative, critical care, and pain medicine to advance patient care.

EDITOR-IN-CHIEF

Evan D. Kharasch, M.D., Ph.D.
St. Louis, Missouri

EXECUTIVE EDITORS

Michael J. Avram, Ph.D., Chicago, Illinois
Charles D. Collard, M.D., Houston, Texas
Deborah J. Culley, M.D., Boston, Massachusetts
Jerrold H. Levy, M.D., F.A.H.A., F.C.C.M.,
Durham, North Carolina
James P. Rathmell, M.D., Boston, Massachusetts

STATISTICAL EDITOR

Timothy T. Houle, Ph.D.
Boston, Massachusetts

EDITORS

J. David Clark, M.D., Ph.D., Palo Alto, California
Andrew Davidson, M.B.B.S., M.D., F.A.N.Z.C.A.,
Victoria, Australia
Shiroh Isono, M.D., Chiba, Japan
Brian P. Kavanagh, M.B., F.R.C.P.C., Toronto, Canada
Sachin Khetarpal, M.D., M.B.A., Ann Arbor, Michigan
Piyush M. Patel, M.D., F.R.C.P.C., San Diego, California
Daniel I. Sessler, M.D., Cleveland, Ohio

ASSOCIATE EDITORS

Takashi Asai, M.D., Ph.D., Osaka, Japan
Brian Thomas Bateman, M.D., Boston, Massachusetts
George S. Bause, M.D., M.P.H., Cleveland, Ohio
Beatrice Beck-Schimmer, M.D., Zurich, Switzerland
Chad Michael Brummett, M.D., Ann Arbor, Michigan
John Butterworth, M.D., Richmond, Virginia
Jaume Canet, M.D., Ph.D., Barcelona, Spain
Vincent W. S. Chan, M.D., F.R.C.P.C., F.R.C.A., Toronto, Canada
Steven P. Cohen, M.D., Baltimore, Maryland
Albert Dahan, M.D., Ph.D., Leiden, The Netherlands
Holger K. Eltzschig, M.D., Ph.D., Houston, Texas
Amanda A. Fox, M.D., M.P.H., Dallas, Texas
Jorge A. Galvez, M.D., Philadelphia, Pennsylvania
Laurent Gance, M.D., Rochester, New York
Stephen T. Harvey, M.D., Nashville, Tennessee
Harriet W. Hopf, M.D., Salt Lake City, Utah
Vesna Jevtovic-Todorovic, M.D., Ph.D., M.B.A.,
Aurora, Colorado
Ru-Rong Ji, Ph.D., Durham, North Carolina
Yandong Jiang, M.D., Ph.D., Nashville, Tennessee
Cor J. Kalkman, M.D., Utrecht, The Netherlands
Kate Leslie, M.B.B.S., M.D., M.Epi., F.A.N.Z.C.A.,
Parkville, Australia
Martin J. London, M.D., San Francisco, California
George A. Mashour, M.D., Ph.D., Ann Arbor, Michigan
Jochen D. Muehlschlegel, M.D., M.M.Sc., Boston, Massachusetts
Paul S. Myles, M.B., B.S., M.P.H., M.D., F.F.A.R.C.S.I.,
F.A.N.Z.C.A., Melbourne, Australia
Peter Nagele, M.D., M.Sc., St. Louis, Missouri
Mark D. Neuman, M.D., M.Sc., Philadelphia, Pennsylvania
Craig Palmer, M.D., Tucson, Arizona
Cyril Rivat, M.D., Montpellier, France
Warren S. Sandberg, M.D., Ph.D., Nashville, Tennessee
Alan Jay Schwartz, M.D., M.S.Ed., Philadelphia, Pennsylvania
Allan F. Simpao, M.D., Philadelphia, Pennsylvania
Nikolaos J. Skubas, M.D., New York, New York
Jamie W. Sleight, M.D., Hamilton, New Zealand
BobbieJean Sweitzer, M.D., F.A.C.P., Chicago, Illinois
Marcos F. Vidal Melo, M.D., Ph.D., Boston, Massachusetts
David S. Warner, M.D., Durham, North Carolina
Hannah Wunsch, M.D., M.Sc., Toronto, Canada

ANESTHESIOLOGY is abstracted or indexed in Index Medicus/MEDLINE, Science Citation Index/SciSearch, Current Contents/Clinical Medicine, Current Contents/Life Sciences, Reference Update, EMBASE/Excerpta Medica, Biological Abstracts (BIOSIS), Chemical Abstracts, Hospital Literature Index, and Comprehensive Index to Nursing and Allied Health Literature (CINAHL).

Authors may order quantity print or electronic reprints of their own articles using the order form supplied with their proofs and posted to the journal Web site. For all other bulk purchases, please contact reprintsolutions@wolterskluwer.com in North America, Carlos Moreyra (Carlos.Moreyra@wkglobal.com) in Latin America, and Jean Jones (PS-Reprints@wolterskluwer.com) in Europe and elsewhere.

The affiliations, areas of expertise, and conflict-of-interest disclosure statements for each Editor and Associate Editor can be found on the Journal's Web site (www.anesthesiology.org).