



CHEST

For specialists in: Pulmonology, Critical Care Medicine, Sleep Medicine, Thoracic Surgery, Cardiorespiratory Interactions, and related specialists

Editor in Chief: Richard S. Irwin, MD, FCCP, Worcester, MA

Associate Editors

Peter J. Barnes, DM, FCCP
London, England

Christopher E. Brightling, MBBS, FCCP
Leicester, England

Nancy A. Collop, MD, FCCP
Baltimore, MD

Bruce L. Davidson, MD, MPH, FCCP
Doha, Qatar

Jesse B. Hall, MD, FCCP
Chicago, IL

Nicholas S. Hill, MD, FCCP
Boston, MA

Mary Sau-Man Ip, MD, FCCP
Hong Kong, China

Surinder K. Jindal, MD, FCCP
Chandigarh, India

Robert G. Johnson, MD, FCCP
St. Louis, MO

Scott Manaker, MD, PhD, FCCP
Philadelphia, PA

Susan Murin, MD, MSc, FCCP
Davis, CA

Paul M. O'Byrne, MBBCh, FCCP
Hamilton, ON, Canada

Dario Olivieri, MD, FCCP
Parma, Italy

Bruce K. Rubin, MD, FCCP
Winston-Salem, NC

Marvin I. Schwarz, MD, FCCP
Denver, CO

Virend K. Somers, MD, FCCP
Rochester, MN

Section Editors

Recent Advances in Chest Medicine

Jesse B. Hall, MD, FCCP, Chicago, IL
Nicholas S. Hill, MD, FCCP, Boston, MA

Translating Basic Research into Clinical Practice

Peter J. Barnes, DM, FCCP, London, England
Paul M. O'Byrne, MBBCh, FCCP,
Hamilton, ON, Canada

Medical Ethics

Constantine A. Manthous, MD, FCCP,
Bridgeport, CT

Global Medicine

Mary Sau-Man Ip, MD, FCCP, Hong Kong, China
Surinder K. Jindal, MD, FCCP, Chandigarh, India

Topics in Practice Management

Scott Manaker, MD, PhD, FCCP, Philadelphia, PA

Transparency in Health Care

William F. Dunn, MD, FCCP, Rochester, MN
Joseph G. Murphy, MD, FCCP, Rochester, MN

Contemporary Reviews in Sleep Medicine

Nancy A. Collop, MD, FCCP, Baltimore, MD
Virend K. Somers, MD, Rochester, MN

Contemporary Reviews in Critical Care Medicine

Howard L. Corwin, MD, FCCP, Lebanon, NH
Curtis N. Sessler, MD, FCCP, Richmond, VA

Chest Imaging for Clinicians

David P. Naidich, MD, FCCP, New York, NY
Suhail Raoof, MD, FCCP, Brooklyn, NY
William D. Travis, MD, FCCP, New York, NY

Case Records from the University of Colorado

Marvin I. Schwarz, MD, FCCP, Denver, CO

Pulmonary and Critical Care Pearls

John E. Heffner, MD, FCCP, Portland, OR
Steven A. Sahn, MD, FCCP, Charleston, SC

Medical Writing Tips of the Month

J. Patrick Barron, Tokyo, Japan

Interactive Physiology Grand Rounds

Michael J. Parker, MD, FCCP, Boston, MA
Richard M. Schwartzstein, MD, FCCP, Boston, MA

Procedure Videos Online

Armin Ernst, MD, FCCP, Boston, MA

Pectoriloquy

Michael B. Zack, MD, FCCP, Medford, MA

Second Opinion

Rob Rogers, Editorial Cartoonist, Pittsburgh, PA

International Edition Editors and Coordinators

China

NanShan Zhong, MD, FCCP, Guangzhou, China

India

Surinder K. Jindal, MD, FCCP, Chandigarh, India

Italy

Francesco de Blasio, MD, FCCP, Naples, Italy

Turkey

Gunseli Kiling, MD, FCCP, Istanbul, Turkey

Publisher

Alvin Lever, MA, FCCP (Hon)

Executive Editor

Stephen J. Welch

Managing Editor

Jean Rice

Assistant Managing Editor

Carla Miller

Assistant Editor, Editor in Chief Office

Cynthia T. French, NP, MS (Worcester, MA)

Advertising and Production Manager

Patricia A. Micek

Circulation/Editorial Coordinator

Barbara J. Anderson

Editorial Coordinator

Laura Lipsey

National Advertising Sales Representatives

The Walchli Tauber Group, Inc.

2225 Old Emmorton Road, Suite 201

Bel Air, MD 21015

Telephone: (443)512-8899

Fax: (443)512-8909

Gary Walchli: ext 102

Steve Tauber: ext 103

CHEST (USPS 157-860 ISSN 0012-3692) is published monthly by the American College of Chest Physicians, 3300 Dundee Rd, Northbrook, IL 60062-2348. The ACCP may be contacted by telephone: (847)498-1400; Fax: (847)498-5460; e-mail: editor@chestnet.org or through the World Wide Web home page: <http://www.chestnet.org>. Periodicals postage paid at Northbrook, IL and additional mailing offices.

COPYRIGHT © 2008 The American College of Chest Physicians

POSTMASTER: Send address changes to: *CHEST*, 3300 Dundee Rd, Northbrook, IL 60062-2348.

ANNUAL SUBSCRIPTION RATES (Rates effective January 1, 2008.)

Personal: Print & Online \$228.00; Print & Online with Canadian GST \$228.00 + \$11.40.

Institutional: Visit <http://www.chestjournal.org/subscriptions/cost.shtml> to view tiered institutional rates and description of institutional type. For more information, please contact *CHEST* Customer Relations by e-mail: subscriptions@chestnet.org or call (800) 343-2227 U.S. or (847)-498-1400 Canada/Intl.

International Special Air Delivery: Please add \$96.00 per print subscription.

SINGLE COPIES (Rates effective January 1, 2008.) *CHEST*: Issues and Supplements \$25.00 each.

DISCLAIMER: The statements and opinions contained in editorials and articles in this Journal are solely those of the authors thereof and not of the Journal's Editor-in-Chief, peer reviews The American College of Chest Physicians, its officers, regents, members, or employees. The appearance of advertisements or services advertised or of their effectiveness, quality, or safety are solely those of the advertisers. The Editor in Chief, the American College of Chest Physicians, its officers, regents, members, and employees disclaim all responsibility for any statements, opinions, recommendations, injury to persons or property resulting from any ideas or products referred to in articles or advertisements contained in this Journal.

Editorial Board

- Ellinor Ådelroth, MD, PhD, Umea, Sweden
W. Michael Alberts, MD, FCCP, Tampa, FL
Raouf Amin, MD, Cincinnati, OH
Ezra A. Amsterdam, MD, Sacramento, CA
Stephen P. Baker, MScPH, Worcester, MA
Daniel E. Banks, MD, MS, FCCP, Shreveport, LA
David J. Barnes, MD, FCCP, Newtown, NSW, Australia
J. Patrick Barron, Tokyo, Japan
Robert P. Baughman, MD, FCCP, Cincinnati, OH
Brian A. Boehlecke, MD, MSPH, FCCP, Chapel Hill, NC
Maria R. Bonsignore, MD, Palermo, Italy
Louis-Philippe Boulet, MD, Quebec City, QC, Canada
Kevin K. Brown, MD, FCCP, Denver, CO
Lee K. Brown, MD, FCCP, Albuquerque, NM
Andrew Bush, MD, London, United Kingdom
Sean M. Caples, DO, Rochester, MN
Shannon S. Carson, MD, FCCP, Chapel Hill, NC
Bartolome R. Celli, MD, FCCP, Boston, MA
Alfredo Chetta, MD, FCCP, Parma, Italy
Prashant N. Chhajed, MBBS, DNB, MD, FCCP, Basel, Switzerland
Jason D. Christie, MD, MS, FCCP, Philadelphia, PA
Andrew Churg, MD, Vancouver, BC, Canada
Lisa C. Cicutto, PhD, RN, Denver, CO
Donald W. Cockcroft, MD, FCCP, Saskatoon SK, Canada
Gene L. Colice, MD, FCCP, Washington, DC
Howard L. Corwin, MD, FCCP, Lebanon, NH
Gregory P. Cosgrove, MD, FCCP, Denver, CO
William G. Cotts, MD, Chicago, IL
Donald E. Craven, MD, Burlington, MA
Robert J. O. Davies, DM, Oxford, United Kingdom
Ivor S. Douglas, MD, FCCP, Denver, CO
Roland M. du Bois, MD, MA, FCCP, Denver, CO
William F. Dunn, MD, FCCP, Rochester, MN
C. Gregory Elliott, MD, FCCP, Salt Lake City, UT
Paul L. Enright, MD, Tucson, AZ
Armin Ernst, MD, FCCP, Boston, MA
Kevin R. Flaherty, MD, MS, Ann Arbor, MI
Kenneth E. Fletcher, PhD, Worcester, MA
Antonio Foresi, MD, Sesto San Giovanni, Italy
Barry A. Franklin, PhD, Royal Oaks, MI
Apoor S. Gami, MD, FCCP, Rochester, MN
Samuel Z. Goldhaber, MD, FCCP, Boston, MA
Roger S. Goldstein, MD, FCCP, Toronto, ON, Canada
James R. Gossage, MD, FCCP, Augusta, GA
Ronald F. Grossman, MD, FCCP, Mississauga, ON, Canada
Gordon H. Guyatt, MD, FCCP, Hamilton, ON, Canada
Ann C. Halbower, MD, Baltimore, MD
John Hankinson, PhD, Valdosta, GA
Timothy W. Harrison, MD, Nottingham, United Kingdom
Paul M. Hassoun, MD, FCCP, Baltimore, MD
Stephen O. Heard, MD, FCCP, Worcester, MA
John E. Heffner, MD, FCCP, Portland, OR
Hitoshi Hirose, MD, PhD, FCCP, Philadelphia, PA
Jack Hirsh, MD, FCCP, Hamilton, ON, Canada
Leslie A. Hoffman, PhD, RN, Pittsburgh, PA
Steven M. Hollenberg, MD, FCCP, Camden, NJ
Rolf D. Hubmayr, MD, FCCP, Rochester, MN
Ferdinando Iellamo, MD, Rome, Italy
James R. Jett, MD, FCCP, Rochester, MN
Paul W. Jones, PhD, London, United Kingdom
Jyotsna M. Joshi, MD, Mumbai, India
Marc A. Judson, MD, FCCP, Charleston, SC
Eitan Kerem, MD, Jerusalem, Israel
Dong Soon Kim, MD, Seoul, Korea
Hardy Kornfeld, MD, FCCP, Worcester, MA
Kevin L. Kovitz, MD, MBA, FCCP, Elk Grove Village, IL
John P. Kress, MD, FCCP, Chicago, IL
Yves Lacasse, MD, MSc, Quebec City, QC, Canada
Mark Larché, PhD, Hamilton, ON, Canada
Teofilo L. Lee-Chiong, MD, FCCP, Denver, CO
Stephanie M. Levine, MD, FCCP, San Antonio, TX
Craig M. Lilly, MD, FCCP, Worcester, MA
Gregory Y. H. Lip, MD, Birmingham, United Kingdom
Carlos M. Luna, MD, FCCP, Buenos Aires, Argentina
Neil R. MacIntyre, MD, FCCP, Durham, NC
J. Mark Madison, MD, FCCP, Worcester, MA
Donald A. Mahler, MD, FCCP, Lebanon, NH
Atul Malhotra, MD, FCCP, Boston, MA
David M. Mannino, MD, FCCP, Lexington, KY
Constantine A. Manthous, MD, FCCP, Bridgeport, CT
Carole L. Marcus, MBCh, FCCP, Philadelphia, PA
Vallerie V. McLaughlin, MD, FCCP, Ann Arbor, MI
Atul C. Mehta, MBBS, FCCP, Cleveland, OH
Mark L. Metersky, MD, FCCP, Farmington, CT
Lawrence C. Mohr, MD, FCCP, Charleston, SC
Babak Mokhlesi, MD, MSc, FCCP, Chicago, IL
Nicholas W. Morrell, MD, Cambridge, United Kingdom
Joel Moss, MD, PhD, Bethesda, MD
Joseph G. Murphy, MD, FCCP, Rochester, MN
David P. Naidich, MD, FCCP, New York, NY
Parameswaran Nair, MD, PhD, Hamilton, ON, Canada
Krzysztof Narkiewicz, MD, PhD, Gdansk, Poland
Michael S. Niederman, MD, FCCP, Mineola, NY
Imre Noth, MD, FCCP, Chicago, IL
Patrick T. O'Gara, MD, Boston, MA
Harold I. Palevsky, MD, FCCP, Philadelphia, PA
Scott M. Palmer, MD, MHS, FCCP, Durham, NC
Michael J. Parker, MD, FCCP, Boston, MA
Polly E. Parsons, MD, FCCP, Burlington, VT
Alan L. Plummer, MD, FCCP, Atlanta, GA
Naresh M. Punjabi, MD, PhD, FCCP, Baltimore, MD
Suhail Raouf, MD, FCCP, Brooklyn, NY
Stephen I. Rennard, MD, FCCP, Omaha, NE
M. Patricia Rivera, MD, FCCP, Chapel Hill, NC
Jesse Roman, MD, FCCP, Atlanta, GA
Mark J. Rosen, MD, FCCP, New Hyde Park, NY
John C. Ruckdeschel, MD, FCCP, Detroit, MI
Jay H. Ryu, MD, FCCP, Rochester, MN
Marina Saetta, MD, FCCP, Padova, Italy
Steven A. Sahn, MD, FCCP, Charleston, SC
Mark H. Sanders, MD, FCCP, Pittsburgh, PA
Gregory A. Schmidt, MD, FCCP, Iowa City, IA
Richard M. Schwartzstein, MD, FCCP, Boston, MA
Curtis N. Sessler, MD, FCCP, Richmond, VA
Surendra K. Sharma, MD, PhD, FCCP, New Delhi, India
Don D. Sin, MD, FCCP, Vancouver, BC, Canada
Jay S. Steingrub, MD, FCCP, Springfield, MA
Robert A. Stockley, MD, DSc, Birmingham, United Kingdom
Mary E. Strek, MD, Chicago, IL
Harold M. Szerlip, MD, FCCP, Augusta, GA
Victor Tapson, MD, FCCP, Raleigh, NC
Donald P. Tashkin, MD, FCCP, Los Angeles, CA
Antoni Torres, MD, FCCP, Barcelona, Spain
Mary C. Townsend, DrPH, Pittsburgh, PA
William D. Travis, MD, FCCP, New York, NY
Jean-Louis Vincent, MD, PhD, FCCP, Brussels, Belgium
V. K. Vijayan, MD, FCCP, Delhi, India
Peter D. Wagner, MD, La Jolla, CA
Emiel F. M. Wouters, MD, FCCP, Maastricht, Netherlands
Kwok Yung Yuen, MD, Hong Kong, China
Michael B. Zack, MD, FCCP, Medford, MA
Dani S. Zander, MD, Hershey, PA
Joseph B. Zwischenberger, MD, FCCP, Lexington, KY

Future Sites for CHEST

CHEST—Annual International Scientific Assembly and the Clinical World Congress on Diseases of the Chest

CHEST 2009 San Diego, CA - October 31 - November 5, 2009

CHEST 2010 Vancouver, Canada - October 29 - November 4, 2010

CHEST 2011 Honolulu, Hawaii - October 22-27, 2011



Coordinatore editoriale: Francesco de Blasio

Unità Funzionale di Riabilitazione Respiratoria, Casa di Cura "Clinic Center", Napoli
Regent ACCP Capitolo Italiano

Direttore responsabile: Antonio Schiavulli

Board editoriale

Vincenzo Bellia Cattedra di Malattie dell'Apparato Respiratorio Ospedale "V. Cervello", Palermo Governor ACCP Capitolo Italiano	Claudio Micheletto UOC di Pneumologia Ospedale Orlandi, Bussolengo (VR) Governor ACCP Capitolo Italiano	Cava de' Tirreni (SA); Dipartimento delle Discipline Mediche ASL Salerno 1, Salerno Governor ACCP Capitolo Italiano
Alfredo Chetta Sezione di Clinica Pneumologica del Dipartimento di Scienze Cliniche Università degli Studi, Parma Governor ACCP Capitolo Italiano	Dario Olivieri Istituto di Clinica dell'Apparato Respiratorio Università degli Studi, Parma Past Regent ACCP Capitolo Italiano	Onofrio Resta Cattedra di Malattie dell'Apparato Respiratorio Università degli Studi, Bari Governor ACCP Capitolo Italiano
Giuseppe U. Di Maria Cattedra di Malattie dell'Apparato Respiratorio Ospedale Ascoli Tomaselli, Catania Past Regent ACCP Capitolo Italiano	Antonio Palla Sezione di Malattie dell'Apparato Respiratorio Dipartimento Cardio Toracico Università degli Studi, Pisa Governor ACCP Capitolo Italiano	Lucia Spicuzza Dipartimento di Medicina Interna e Medicina Sezione Malattie Respiratorie Università degli Studi, Catania Governor ACCP Capitolo Italiano
Antonio Foresi Servizio di Fisiopatologia Respiratoria Presidio Ospedaliero, Sesto S. Giovanni, Milano Governor ACCP Capitolo Italiano	Mario Polverino Divisione di Fisiopatologia Respiratoria Centro Regionale ad Alta Specializzazione	Federico Venuta Cattedra di Chirurgia Toracica Università "La Sapienza", Roma Governor ACCP Capitolo Italiano

Redazione scientifica

Hanno collaborato alla traduzione degli articoli presenti in questo numero:	Sara Maio (p 41) Unità di Epidemiologia Ambientale Polmonare, Istituto di Fisiologia Clinica del CNR, Pisa	Lucia Spicuzza (p 14) Università degli Studi, Catania
Maurizio Bussotti (p 32) Fisiopatologia Cardiorespiratoria, Istituto di Cardiologia dell'Università degli Studi, Milano	Claudio Micheletto (p 25) Ospedale Orlandi, Bussolengo (VR)	Ersilia Tedeschi (p 18) Malattie dell'Apparato Respiratorio, Policlinico, Bari
Vincenzo Guarriello (p 49) Unità Funzionale di Riabilitazione Respiratoria Casa di Cura "Clinic Center", Napoli	Francesca Polverino (p 5) ASL SA 1, Fisiopatologia Respiratoria Cava de' Tirreni (SA)	

CHEST Edizione Italiana

Periodico trimestrale

Reg. Tribunale di Monza
n° 1566 del 2 gennaio 2002

Segreteria di Redazione

Cristina Degrassi

Impaginazione

MidiaDesign

CTP e stampa

Artestampa sas
Galliate Lombardo (VA)

Pubblicità e Marketing

MIDIA srl

Edizione

Midia srl
Via Cesare Beccaria, 3
34133 Trieste
Tel. 040 3720456
Fax 040 3721012
midia@midiaonline.it
www.midiaonline.it



Questo periodico viene spedito

in abbonamento postale

Prezzo copia € 12,00

Abbonamento a 4 numeri € 48,00

da versare sul c/c postale n° 34827204

intestato a Midia srl, Via Cesare Beccaria 3
34133 Trieste

Copyright © 2009

American College of Chest Physicians

Copyright © 2009 per l'Edizione Italiana

MIDIA srl

La rivista CHEST Edizione Italiana è spedita in abbonamento postale. L'indirizzo in nostro possesso verrà utilizzato per l'invio di questa e di altre pubblicazioni. Ai sensi ed in conformità con l'art. 10 Legge 31 dicembre 1996, n. 675, MIDIA informa che i dati inseriti nell'indirizzo della rivista CHEST Edizione Italiana e quelli ricevuti via fax o lettera di aggiornamento verranno archiviati nel pieno rispetto delle normative vigenti e saranno utilizzati a fini scientifici. È nel diritto del ricevente richiedere la cessazione dell'invio della rivista e/o l'aggiornamento dei dati in nostro possesso.

Chest Edizione Italiana è stata prodotta col permesso dell'American College of Chest Physicians. Prodotti o servizi pubblicitari nel presente numero non sottostanno all'approvazione della United States Food and Drug Administration, né tanto meno sono riconosciuti, noti, approvati, usati o altrimenti accettati dall'American College of Chest Physicians. MIDIA si assume piena responsabilità per prodotti e servizi pubblicitari nel presente numero e solleva l'ACCP da eventuali azioni da essi derivanti.

The American College of Chest Physicians played no role in the translation of these articles from English into the Italian language, and cannot be held responsible for any errors, omissions, or other possible defects in the translation of the article.

L'American College of Chest Physicians declina ogni responsabilità per la traduzione degli articoli, dall'inglese all'italiano, e per eventuali errori, omissioni o refusi presenti nella traduzione degli articoli.