European Heart Journal – Cardiovascular Imaging
academic.oup.com/ehjcimaging

European Heart Journal – Cardiovascular Imaging is a monthly international peer reviewed journal dealing with Cardiovascular Imaging. It is an official publication of the European Association of Cardiovascular Imaging, a registered branch of the European Society of Cardiology.

EDITOR-IN-CHIEF
Gerald Maurer, Austria

DEPUTY EDITORS
Jutta Bergler-Klein, Austria
Senta Graf, Austria

ASSOCIATE EDITORS
Frank Bengel, Germany
Peter Buser, Switzerland
Filippo Cademartiri, Netherlands
Genevieve Derumeaux, France
Bernard Gerber, Belgium
Bijoy Khandheria, USA
Itzhak Kronzon, USA
Patrizio Lancellotti, Belgium
Carlo di Mario, UK
Pal Maurovich-Horvat, Hungary
Luc Mertens, Canada
Danilo Neglia, Italy
Frank Rademakers, Belgium
Antti Saraste, Finland
Rosa Sicari, Italy
Jose L. Zamorano, Spain

SENIOR CONSULTING EDITORS
Daniel Berman, USA
Eugene Braunwald, USA
John Cleland, UK
Raimund Erbel, Germany
Charles Higgins, USA
Heinrich Schelbert, USA
Markus Schwaiger, Germany
Udo Sechtem, Germany
Pravin Shah, USA
Jamil Tajik, USA

SENIOR ASSOCIATE EDITORS
Juhani Knutti, Finland
Luc Piérard, Belgium
Sven Plein, UK

EDITORIAL ASSISTANT
Sharon Batty
ehjcimaging.editorialoffice@oup.com

LIAISON EDITORS TO EHJ
Philipp Kaufmann, Switzerland
Juerg Schwitter, Switzerland
Jens-Uwe Voigt, Belgium

INTERNATIONAL EDITORIAL BOARD

S. Achenbach, Germany
E. Agricola, Italy
M. Al Mallah, Saudi Arabia
H. Arheden, Sweden
L. Badano, Italy
H. Baumgartner, Germany
J. Bax, Netherlands
B. Bijnens, Spain
T. Binder, Austria
J. Bogaert, Belgium
E. Bossone, Italy
R. Botnar, UK
H. Boudoulas, Greece
O. Breithardt, Germany
C. Bucciarelli-Ducci, UK
W. Budts, Belgium
P. Buser, Switzerland
E. G. Caiani, Italy
N. Cardim, Portugal
S. Carej, Italy
A. Cohen, France
B. Cosyns, Belgium
E. Dall’Ammertina, UK
V. Delgado, Netherlands
M. Desai, USA
E. Donal, France
T. Edvardsen, Norway
J. Escaned, Spain
A. Evangelista, Spain
F. Flachskampf, Sweden
A. Flotats, Spain
H. Frank, Austria
O. Gaemperli, Switzerland
M. Galderisi, Italy
E. Garcia, USA
T. Gillebert, Belgium
G. Goliash, Austria
G. Grei, UK
G. Habib, France
M. Hacker, Austria
P. Hoffman, Poland
U. Hoffmann, Germany
O. Kamp, Netherlands
P. Knaapen, Netherlands
S. Kozerke, Switzerland
H. Lamb, Netherlands
P. Lancellotti, Belgium
R. Lang, USA
R. Levine, USA
J. Lima, USA
M. Lombardi, Italy
J. Magne, France
M. Markl, USA
T. Marwick, Australia
J. Mascherbauer, Austria
S. Matskeplishvili, Russia
B. Metzler, Austria
R. Mohiaddin, UK
F. Mookadam, USA
J. Moon, UK
D. Muraru, Italy
E. Nagel, Germany
N. Nakatani, Japan
N. Nanda, USA
J. Narula, USA
A. Neskovic, Serbia
H. Nesser, Austria
K. Nieman, USA
P. Nihoyannopoulos, UK
N. Ozer, Turkey
N. Pandian, USA
P. Perrone-Filardi, Italy
S. Petersen, UK
P. Pibarot, Canada
E. Picano, Italy
F. Pinto, Portugal
M. Poon, USA
B. Popescu, Romania
O. Rimoldi, Italy
R. Rosenhek, Austria
E. Sade, Turkey
D. Sahn, USA
M. Schaefer, Germany
S. Schroeder, Germany
J. Schulz-Menger, Germany
P. Sengupta, USA
R. Senior, UK
L. Shaw, USA
R. Siegel, USA
J. Simpson, UK
P. Spirito, Italy
M. Stuber, USA
N. Tamaki, Japan
A. Taylor, UK
C. Tei, Japan
J. Thomas, USA
Y. Topilsky, Israel
C. Tribouilloy, France
D. Tylles, UK
R. Underwood, UK
E. Van der Wall, Netherlands
J-L. Vanoverschelde, Belgium
Z. Vered, Israel
K. Yoshida, Japan
M. Zellweger, Switzerland
W. Zoghbi, USA

academic.oup.com/ehjcimaging/issue/19/4
European Association of Cardiovascular Imaging, a Registered Branch of the European Society of Cardiology

Executive Board Members
President: Prof Bogdan A. Popescu (Romania)
President-Elect: Prof Thor Edvardsen (Norway)
Past-President: Prof Gilbert Habib (France)
Vice-President/CMR Section Chair: Dr Chiara Bucciarelli-Ducci (UK)
Vice-President/Echo Section Chair: Prof Erwan Donal (France)
Vice-President/Nuclear C & CCT Section Chair: Dr Oliver Gaemperli (Switzerland)
Secretary: Prof Frank Flachskampf (Sweden)
Treasurer: Prof Bernard Cosyns (Belgium)
Editor-in-Chief: Prof G Maurer, FESC (Austria)

Education Committee
Chair: Dr Denisa Muraru (Italy)

Accreditation and Certification Committee
Chair: Dr Mark Westwood (UK)

Scientific Committee
Chair: Dr Victoria Delago (Netherlands)

Industry Round Table Committee
Chair: Prof Nuno Cardim (Portugal)

Councillors
Dr Victoria Delgado (Netherlands)
Dr Giovanni Di Salvo (UK)
Prof Bernhard Gerber (Belgium)
Dr Julien Magne (France)
Dr Denisa Muraru (Italy)
Dr Danilo Neglia (Italy)

Ex-Officio Members
Dr Pal Maurovich-Horvat (Hungary)
Dr Matteo Cameli (Italy)
Prof Nuno Cardim (Portugal)
Dr Owen Miller (UK)
Dr Elif Leila Sade (Turkey)
Dr Mark Westwood (UK)
Working Group CHD: Dr Owen Miller (UK)

academic.oup.com/ehjcimaging
Aims and Scope

European Heart Journal - Cardiovascular Imaging is a monthly international peer reviewed journal dealing with Cardiovascular Imaging. It is an official publication of the European Association of Cardiovascular Imaging, a registered branch of the European Society of Cardiology.

The journal aims to publish the highest quality material, both scientific and clinical from all areas of cardiovascular imaging including echocardiography, magnetic resonance, computed tomography, nuclear and invasive imaging. A range of article types will be considered, including original research, reviews, editorials, image focus, letters and recommendation papers from relevant groups of the European Society of Cardiology. In addition it provides a forum for the exchange of information on all aspects of cardiovascular imaging.

Authors wishing to submit to European Heart Journal - Cardiovascular Imaging should refer to the instructions to authors (https://academic.oup.com/ehjcimaging/pages/General_Instructions) and submit papers to the online submission system (http://www.editorialmanager.com/ehjc/)

A subscription to the European Heart Journal - Cardiovascular Imaging comprises 12 issues (includes European Heart Journal - Cardiovascular Imaging Supplements). All prices include postage, and for subscribers outside the UK delivery is by Standard Air. Advance Access contains papers that have reached corrected proof stage, but have not yet been included within an issue. Advance Access is updated daily.

Annual subscription rate (Volume 19, 12 issues, 2018)

Institutional
Print edition and site-wide online access: £838.00/$1592.00/€1257.00
Print edition only: £771.00/$1465.00/€1156.00
Site-wide online access only: £629.00/$1195.00/€944.00
Personal
Print edition and individual online access: £224.00/$425.00/€335.00
Please note: USS rate applies to US & Canada, Euros apply to Europe, UK applies to UK and Rest of World.

There may be other subscription rates available, for a complete listing please visit https://academic.oup.com/ehjcimaging/subscribe.

Full prepayment, in the correct currency, is required for all orders. Orders are regarded as firm and payments are not refundable. Subscriptions are accepted and entered on a complete volume basis. Claims cannot be considered more than FOUR months after publication or date of order, whichever is later. All subscriptions in Canada are subject to GST. Subscriptions in the EU may be subject to European VAT. If registered, please supply details to avoid unnecessary charges. For subscriptions that include online versions, a proportion of the subscription price may be subject to UK VAT. Personal rate subscriptions are only available if payment is made by personal cheque or credit card and delivery is to a private address.

Annual subscription rate (Volume 19, 12 issues, 2018)

Institutional
Print edition and site-wide online access: £838.00/$1592.00/€1257.00
Print edition only: £771.00/$1465.00/€1156.00
Site-wide online access only: £629.00/$1195.00/€944.00
Personal
Print edition and individual online access: £224.00/$425.00/€335.00
Please note: USS rate applies to US & Canada, Euros apply to Europe, UK applies to UK and Rest of World.

There may be other subscription rates available, for a complete listing please visit https://academic.oup.com/ehjcimaging/subscribe.

Full prepayment, in the correct currency, is required for all orders. Orders are regarded as firm and payments are not refundable. Subscriptions are accepted and entered on a complete volume basis. Claims cannot be considered more than FOUR months after publication or date of order, whichever is later. All subscriptions in Canada are subject to GST. Subscriptions in the EU may be subject to European VAT. If registered, please supply details to avoid unnecessary charges. For subscriptions that include online versions, a proportion of the subscription price may be subject to UK VAT. Personal rate subscriptions are only available if payment is made by personal cheque or credit card and delivery is to a private address.

The current year and two previous years’ issues are available from Oxford Journals. Previous volumes can be obtained from the Periodicals Service Company at http://www.periodicals.com/oxford.html or Periodicals Service Company, 11 Main Street, Germantown, NY 12526, USA. E-mail: psc@periodicals.com. Tel: (518) 537-4700. Fax: (518) 537-5899.

For further information, please contact: Journals Customer Service Department, Oxford University Press, Great Clarendon Street, Oxford OX2 6DP, UK. E-mail: jnl-cust.serv@oup.com. Tel (and answerphone outside normal working hours): +44 (0)1865 353907. Fax: +44 (0)1865 353485. In the US, please contact: Journals Customer Service Department, Oxford University Press, 2001 Evans Road, Cary, NC 27513, USA. E-mail: jnlorders@oup.com. Tel (and answerphone outside normal working hours): 800 852 7323 (toll-free in USA/Canada). Fax: 919677 1714. In Japan, please contact: Journals Customer Service, Oxford Journals, Oxford University Press, 4-5-10-8F, Shiba, Minatoku, Tokyo, 108-8366, Japan. E-mail: custserv.jp@oup.com. Tel: +81 3 5444 5858. Fax: +81 3 3454 2929.

Methods of payment. Payment may be made: by cheque (to Oxford University Press, Cashiers’ Office, Great Clarendon Street, Oxford OX2 6DP, UK); by bank transfer (to Barclays Bank Plc, Oxford Office, Oxford (bank sort code 20-65-18) (UK); overseas only Swift code BARC GB22); by credit card (Mastercard, Visa, Switch or American Express).

The European Heart Journal - Cardiovascular Imaging is printed by Bell and Bain Ltd, Glasgow on acid-free paper.

Environmental and ethical policies

Oxford Journals, a division of Oxford University Press, is committed to working with the global community to bring the highest quality research to the widest possible audience. Oxford Journals will protect the environment by implementing environmentally friendly policies and practices wherever possible. Please see https://academic.oup.com/journals/pages/about_us/ethical_policies for further information on environmental and ethical policies.

Supplements, reprints and corporate sales

For requests from industry and companies regarding supplements, bulk article reprints, sponsored subscriptions, translation opportunities for previously published material, and corporate online opportunities, please e-mail special.sales@oup.com, fax +44 (0)1865 353774 or visit http://www.oupmediainfo.com/#/reprints/prints.

Digital object identifier (DOI)

For information about DOIs and to resolve them, please visit http://www.doi.org/

Permissions

For information on how to request permissions to reproduce articles/information from this journal, please visit https://academic.oup.com/journals/pages/access_purchase/rights_and_permissions.

Advertising

Advertising, inserts and artwork enquiries should be addressed to: Advertising and Special Sales, Oxford Journals, Oxford University Press, Great Clarendon Street, Oxford OX2 6DP, UK. Tel: +44 (0)1865 353774; Fax: +44 (0)1865 353774; E-mail: jnladvertising@oup.com.

Instructions for authors

Full instructions for manuscript preparation and submission can be found through the European Heart Journal - Cardiovascular Imaging home page at: https://academic.oup.com/ehjcimaging.

Drug disclaimer

The mention of trade names, commercial products or organizations, and the inclusion of advertisements in the journal does not imply endorsement by EHJCI, the editors, the editorial board, Oxford University Press or the organization to which the authors are affiliated. The editors and publishers have taken all reasonable precautions to verify drug names and doses, the results of experimental work and clinical findings published in the journal. The ultimate responsibility for the use and dosage of drugs mentioned in the Journal and in interpretation of published material lies with the medical practitioner, and the editors and publisher cannot accept liability for damages arising from any error or omission in the journal. Please inform the editors of any errors.

Material disclaimer

The opinions expressed in EHJCI are those of the authors and contributors, and do not necessarily reflect those of the European Heart Rhythm Association, the European Society of Cardiology, the editors, the editorial board, Oxford University Press or the organization to which the authors are affiliated.

© The European Society of Cardiology 2018

All rights reserved; no part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission of the Publishers, or a licence permitting restricted copying issued in the UK by the Copyright Licensing Agency Ltd, 90 Tottenham Court Road, London W1P 9HE, or in the USA by the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

Society

All members of national cardiac societies in Europe, ESC Associations, Working Groups and Councils, are automatically members of the European Society of Cardiology and are entitled to receive the journal at the special reduced rate.

For more details please visit: https://www.escardio.org/The-ESC/Membership Typeset by Cenevo Publisher Services, Bangalore, India.

Printed by Bell and Bain Ltd, Glasgow on acid-free paper.