

11

Update in Intensive Care and Emergency Medicine

Edited by J.L.Vincent



Strategy in Bedside Hemodynamic Monitoring

Edited by
J.-F. Dhainaut and D. Payen

With 68 Figures and 25 Tables

Springer-Verlag
Berlin Heidelberg New York London
Paris Tokyo Hong Kong Barcelona

Series Editor

Prof. Dr. Jean Louis Vincent
Clinical Director, Department of
Intensive Care, Erasme Hospital,
Free University of Brussels,
Route de Lennik 808,
1070 Brussels, Belgium

Volume Editors

Prof. Dr. Jean-François Dhainaut
Department of Intensive Care,
Cochin Port-Royal University Hospital,
27 rue du Faubourg St Jacques,
75674 Paris Cedex 14, France

Prof. Dr. Didier Payen
Department of Anesthesiology and Intensive Care,
Lariboisière University Hospital, 2 rue Ambroise Paré,
75475 Paris Cedex 10, France

ISBN-13:978-3-540-52471-7 e-ISBN-13:978-3-642-84167-5
DOI: 10.1007/978-3-642-84167-5

Library of Congress Cataloging-in-Publication Data
Strategy in bedside hemodynamic monitoring/edited by J.-F. Dhainaut and D. Payen.
(Update in intensive care and emergency medicine; 11)
ISBN-13:978-3-540-52471-7
1. Hemodynamic monitoring. I. Dhainaut, J.-F. (Jean-François) II. Payen, D. III. Title.

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in other ways, and storage in data banks. Duplication of this publication or parts thereof is only permitted under the provisions of the German Copyright Law of September 9, 1965, in its current version, and a copyright fee must always be paid. Violations fall under the prosecution act of the German Copyright Law.

© Springer-Verlag Berlin Heidelberg 1991

The use of registered names, trademarks, etc. in the publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Product Liability: The publisher can give no guarantee for information about drug dosage and application thereof contained in this book. In every individual case the respective user must check its accuracy by consulting other pharmaceutical literature.

2119/3140-543210 – Printed on acid-free paper

Contents

Introduction – Hemodynamic Monitoring: A Cost/Benefit Analysis (<i>J.-F. Dhainaut and D. Payen</i>)	1
Biophysical Basis of Hemodynamic Measurements (<i>A. Versprille and J. R. C. Jansen</i>)	7
Physiological Determinants of Hemodynamic Parameters (<i>D. Payen</i>)	28
Determining Factors of Tissue O ₂ Uptake (<i>E. Vicaut and M. Duveleroy</i>)	37
The Evaluation of Right Ventricular Function in Man (<i>M. R. Pinsky</i>)	52
Validity and Clinical Applications of Fast Response Thermistor for RVEF Monitoring (<i>J.-F. Dhainaut, F. Brunet, and J.-J. Lanore</i>)	58
Fiberoptic S̄O ₂ Monitoring as Indicator of Changes in Whole Body Oxygen Supply/Demand Relationship (<i>K. Reinhart</i>)	72
Continuous S̄O ₂ Monitoring Using Fiberoptic Swan-Ganz Catheters in the Mechanically-Ventilated Patient (<i>J. J. Rouby</i>)	86
Cardiac Output Measurement in the Critically Ill: Invasive Versus Noninvasive Techniques (<i>J. L. Vincent and M. Goldstein</i>)	97
Computer Assistance for Hemodynamic Evaluation (<i>P. Squara and B. Schremmer</i>)	108

VI Contents

Hemodynamic Monitoring in Cardiac Surgery <i>(J. Boldt and G. Hempelmann)</i>	125
Hemodynamic Monitoring in Noncardiac Surgery <i>(J. F. Baron)</i>	140
Hemodynamic Monitoring in Acute Respiratory Failure <i>(S. Strelbel and D. Scheidegger)</i>	157
Hemodynamic Monitoring in Myocardial Infarction <i>(D. El Allaf)</i>	170
Hemodynamic Monitoring in Septic Shock <i>(A. B. J. Groeneveld and L. G. Thijs)</i>	179
Hemodynamic Monitoring in Trauma <i>(J. D. Edwards)</i>	197
Subject Index	209

List of Contributors

Baron, J. F.

Département d'Anesthésie-Réanimation,
Hôpital Pitié-Salpêtrière,
47 Bd de l'Hôpital,
75651 Paris Cedex 13, France

Boldt, J.

Department of Anesthesiology and
Intensive Care Medicine, Justus-Liebig-
University Giessen, Klinikstrasse 29,
6300 Giessen, West Germany

Brunet, F.

Medical Intensive Care Unit,
Cochin Port-Royal University Hospital,
27 rue du Faubourg St Jacques,
75674 Paris Cedex 14, France

Dhainaut, J.-F.

Medical Intensive Care Unit,
Cochin Port-Royal University Hospital,
27 rue du Faubourg St Jacques,
75674 Paris Cedex 14, France

Duvelleroy, M.

Laboratoire de Biophysique, Hôpital F.
Widal, 200 rue du Faubourg St Denis,
75010 Paris, France

Edwards, J. D.

Intensive Care Unit, University Hospital
of South Manchester, West Didsbury,
Manchester, United Kingdom

El Allaf, D.

Service de Réanimation Médicale
et Cardiaque, Centre Hospitalier Hutois,
2 rue Trois Ponts, 5200 Huy, Belgium

Goldstein, M.

Department of Intensive Care,
Erasme University Hospital,
Route de Lennik 808,
1070 Brussels, Belgium

Groeneveld, A. B. J.

Medical Intensive Care Unit, Free
University Hospital, De Boelelaan 1117,
1081 HV Amsterdam, The Netherlands

Hempelmann, G.

Department of Anesthesiology and
Intensive Care Medicine, Justus-Liebig-
University Giessen, Klinikstrasse 29,
6300 Giessen, West Germany

Jansen, J. R. C.

Department of Pulmonary Diseases,
Erasmus University, P.O. Box 1738,
3000 DR Rotterdam, The Netherlands

Lanore, J.-J.

Medical Intensive Care Unit,
Cochin Port-Royal University Hospital,
27 rue du Faubourg St Jacques,
75674 Paris Cedex 14, France

Payen, D.

Department of Anesthesiology and
Intensive Care, Lariboisière University
Hospital, 2 rue Ambroise Paré,
75475 Paris Cedex 10, France

Pinsky, M. R.

Department of Anesthesiology and
CCM, Suite 910 Liliane Kaufmann
Building, 3471 Fifth Avenue, Pittsburgh,
PA 15213, USA

Reinhart, K.

Department of Anesthesiology,
University Hospital Steglitz,
Hindenburgdamm 30, 1000 Berlin 45,
West Germany

Rouby, J. J.

Surgical Critical Care Unit, Hôpital
Pitié-Salpêtrière, 43 Bd de l'Hôpital,
75651 Paris Cedex 13, France

VIII List of Contributors

Scheidegger, D.

Department of Anesthesia, University
of Basel, Kantonsspital, 4031 Basel,
Switzerland

Schremmer, B.

Medical Intensive Care Unit,
Cochin Port-Royal University Hospital,
27 rue du Faubourg St Jacques,
75674 Paris Cedex 14, France

Squara, P.

Réanimation Médicale, Hôpital V.
Dupouy, 69 rue du Lieutenant Colonel
Prudhon, 95100 Argenteuil, France

Strebel, S.

Department of Anesthesia, University
of Basel, Kantonsspital, 4031 Basel,
Switzerland

Thijs, L. G.

Department of Intensive Care,
Academisch Ziekenhuis,
De Boelelaan 1117,
1007 MB Amsterdam, The Netherlands

Versprille, A.

Department of Pulmonary Diseases,
Erasmus University, P.O. Box 1738,
3000 DR Rotterdam, The Netherlands

Vicaut, E.

Laboratoire de Biophysique et INSERM
U141, Hôpital F. Widal, 200 rue du
Faubourg St Denis, 75010 Paris, France

Vincent, J. L.

Department of Intensive Care,
Erasme University Hospital,
Route de Lennik 808,
1070 Brussels, Belgium