# Table of Contents

**FOCUS ON KEY POINTS ON CRITICAL CARE**

One Clinicians Lifetime of Bringing Technology into Medicine and its Impact upon Critical Care Patients  
F.M. Bird .............................................................. 1

Monitoring in Acute Brain Injury  
E.G. McKeating ......................................................... 19

Brain Protection  
U.M. Illievich, A.-M. Machata, and C.K. Spiess ...................................................... 35

Respiratory Effects of Anaesthesia  
P.R.M. Rocco, and W.A. Zin ............................................... 51

Aspiration of Airway Dead Space: a New Method to Enhance CO₂ Elimination  
E. de Robertis, B. Jonson, and R. Tufano .................................................... 67

Myocardial Preservation during Cardiopulmonary Resuscitation  
T. Pellis, and W. Tang .......................................................... 75

Reduced Post Resuscitation Myocardial Dysfunction after Low-Energy Biphasic Waveform Defibrillation  
T. Pellis, and W. Tang .......................................................... 87

Myocardial Dysfunction in the Perioperative Period  
O.F. Boyd .............................................................. 93

Trauma Resuscitation  
L.J. Kaplan .............................................................. 107

Monitoring of Intra-Abdominal Pressure and Clinical Challenges in Intensive Care Unit Patients  
P. Pelosi, P. Cairoli, and L. Gattinoni ...................................................... 125

Experimenting on Your Fellow Humans in 2001. Update of the Declaration of Helsinki and Progress from the International Conference on Harmonisation  
J.H. Silverstein .............................................................. 137

Ethical, Legal, Practical and Scientific Challenges in Perioperative Medicine  
P.D. Lumb .............................................................. 143

The WHO and Pain  
V. Ventafredda .............................................................. 153

High Frequency Percussive Ventilation  
U. Lucangelo, L. Fontanesi, and F.M. Bird ...................................................... 163

**LUNG**

Experimental Models of Acute Lung Injury  
P.R.M. Rocco, and W.A. Zin ...................................................... 175
# VI Table of Contents

**Animal Models of Asthma**  
J.G. Martin, and J.-P. Lavoie .................................................. 193

**Optimization of Ventilation and Perfusion Matching**  
G. Hedenstierna .......................................................... 205

**Alveolar Recruitment**  
L.M. Bigatello, and P. Caironi ............................................. 215

**How to Open an Atelectatic Lung**  
D.L.H. Poelma, and B. Lachmann .......................................... 225

**Clinical Experience with Open Lung Management Experience in Trauma Patients**  
D. Schreiter, L. Scheibner, and C. Josten .................................... 235

**Semirecumbency Prevents Nosocomial Pneumonia in Mechanically Ventilated Patients**  
M.B. Drakulovic, and A. Torres ........................................... 241

**Acute Bronchial Asthma: Indications for Intensive Care**  
R. Brandolese .......................................................... 253

**Esophageal Pressure in Anaesthetized Patients: Difficulties and Frequent Mistakes**  
J.O.C. Auler, and C.R. Fernandes ........................................... 261

**Haemodynamic and Metabolic Evaluations by Rebreathing Methods**  
M. Girardis, C. Lombardini, and A. Pasetto ......................... 269

**Monitoring Pulmonary Capillary Blood Flow and Alveolar Dead Space Using the Combined Methods of Volumetric Capnography and “Partial CO2 Rebreathing” (Nic02)**  
B. Allaria .......................................................... 275

**Application of “Single Breath Volumetric Capnography” Analysis in Open Lung Strategy: Description of a Monitoring Tool**  
T. Tabor .............................................................. 281

**How Permissive Should Hypercapnia Be?**  
G. Servillo, L. D’Amato, and R. Tufano .................................. 287

**Capnography and Cardiac Output Determination**  
G. Murias, A. Villagra, and L. Blanch ..................................... 299

**Improvements in Percutaneous Tracheostomy: the Single-Step Rotational Dilation**  
G. Frova ............................................................. 305

## TRAUMA

**The Challenges of Delivering Acute Medical Services to Trauma Patients in Remote Locations**  
D.J. Penney, A. Flabouris, and M.J.A. Parr .......................... 317

**Trauma – Stabilization, Assessment and Transportation**  
G. Gordini, and M. Menarini .................................................. 325
<table>
<thead>
<tr>
<th>Topic</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma Intensive Care: Early and Late Challenges</td>
<td>G. Nardi, L. Riccioni, and E. de Blasio</td>
<td>341</td>
</tr>
<tr>
<td>Trauma Scoring Systems</td>
<td>F. Della Corte, G.L. Vignazia, and M. Cavaglià</td>
<td>351</td>
</tr>
<tr>
<td>Blast Injury</td>
<td>M. Muggia-Sullam</td>
<td>363</td>
</tr>
<tr>
<td>Prognosis in Cerebral Dysfunction in Patients with Head Trauma</td>
<td>N. Latronico, R. Stefini, and A. Candiian</td>
<td>369</td>
</tr>
<tr>
<td>Respiratory Failure in Brain Injured Patients</td>
<td>P. Pelosi, G. Colombo, and C. Gamberoni</td>
<td>381</td>
</tr>
<tr>
<td>Blunt Chest Trauma</td>
<td>M. Muggia-Sullam</td>
<td>399</td>
</tr>
<tr>
<td>Abdominal Trauma</td>
<td>G. Sganga, G. Brisinda, and G. Maria</td>
<td>415</td>
</tr>
<tr>
<td>Visceral Trauma: Diagnostic Imaging and Interventional Radiology</td>
<td>F. Pozzi MuCelli</td>
<td>437</td>
</tr>
<tr>
<td>Trauma Operative Procedures: Timing of Surgery and Priorities</td>
<td>G. Sganga, G. Brisinda, and M. Castagneto</td>
<td>447</td>
</tr>
<tr>
<td>Trauma in Children</td>
<td>A.J. Sutcliffe</td>
<td>469</td>
</tr>
<tr>
<td>Trauma in Pregnancy</td>
<td>S.E. Lapinsky</td>
<td>477</td>
</tr>
<tr>
<td>Trauma in the Elderly</td>
<td>G. Berlot, and A. Tomasini</td>
<td>491</td>
</tr>
<tr>
<td>Trauma Anaesthesia and Pain Management</td>
<td>W. Lingnau</td>
<td>501</td>
</tr>
<tr>
<td>Metabolic Pathways in Trauma</td>
<td>G. Biolo</td>
<td>519</td>
</tr>
<tr>
<td>Cardiopulmonary Resuscitation in Trauma and Early Defibrillation</td>
<td>E. Cerchiari, and C. Ajmone Cat</td>
<td>525</td>
</tr>
<tr>
<td>ACID-BASE DISORDERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homeostasis: Basics, Definitions, Clinical Evidence</td>
<td>A. Gullo, and M.L. Chierego</td>
<td>539</td>
</tr>
<tr>
<td>Physical Chemistry and Clinical Acid-Base Physiology</td>
<td>J.A. Kellum</td>
<td>579</td>
</tr>
</tbody>
</table>
A “Post-Copernican” Analysis of Intracellular pH  
S. Magder ................................................................. 589

Physiological Consequences of Acid-Base Disorders  
D.A. Story ................................................................... 611

Clinical Approach to Acid-Base Balance  
S. Magder ............................................................... 617

Using Base Excess  
T.J. Morgan ................................................................ 631

Intraoperative Fluid Management  
M. Rehm, and U. Finsterer ........................................... 643

Fluid Management in GI Surgery  
M.G. Mythen, M. Hamilton, and M. Grocott .................. 655

Postoperative Fluid Management  
G. Berlot, A. Tomasini, and U. Lucangelo ..................... 671

Treatment of Acidosis: Sodium Bicarbonate and Other Drugs  
G.A. Schmidt ............................................................ 681

Lactic Acidosis  
G.A. Schmidt ............................................................ 695

Acid-Base Balance During Renal Replacement Therapies  
Z. Ricci, and C. Ronco .................................................. 707

iPH and Splanchnic Dysfunction Management  
S.M. Jakob ............................................................... 715

Crystalloids / Colloids: Controversies  
C. Sorbara, D. Pittarello, and M. Primadei ..................... 723

PERIOPERATIVE MEDICINE

Preoperative Assessment  
A.F. Hammerle, C. Tatschl, and C. Baumgartner ................ 747

Patient Informed Consent  
F. Carli .................................................................. 757

Coordination and Responsibilities in the Operating Theatre  
N. Weksler, and G.M. Gurman ....................................... 763

How to Plan Anaesthesia  
N.G. Volpe, and R. Alexander ....................................... 771

Monitoring and Assessment of Perioperative Vital Functions in Major Non-Cardiac Surgery  
B. Allaria, and M. Resta ............................................. 777

How to Balance General Anaesthesia  
G. Torri ................................................................ 789
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision-Making during Anaesthesia</td>
<td>795</td>
</tr>
<tr>
<td>G.M. Gurman</td>
<td></td>
</tr>
<tr>
<td>Anaesthesia for Abdominal Surgery</td>
<td>809</td>
</tr>
<tr>
<td>F. Carli</td>
<td></td>
</tr>
<tr>
<td>Total Intravenous Anaesthesia</td>
<td>819</td>
</tr>
<tr>
<td>R. Alexander, and N.G. Volpe</td>
<td></td>
</tr>
<tr>
<td>Dobutamine and Esmolol, Opposite Action or Sometime Synergetic Therapeutic Actions</td>
<td>825</td>
</tr>
<tr>
<td>R. Muchada</td>
<td></td>
</tr>
<tr>
<td>Intraoperative Spinal Cord Monitoring: Evoked Potentials and Cerebrospinal Fluid Oxygenation</td>
<td>835</td>
</tr>
<tr>
<td>J. Lips, and C.J. Kalkman</td>
<td></td>
</tr>
<tr>
<td>E.P. van Dongen, M.A. Schepens, and E.H. Boezeman</td>
<td></td>
</tr>
<tr>
<td>Ischaemic Spinal Cord Injury Following Thoracoabdominal Aneurysm Surgery</td>
<td>853</td>
</tr>
<tr>
<td>P. de Haan, and J. Keseckioglu</td>
<td></td>
</tr>
<tr>
<td>The Elderly: from Physiopathology to Surveillance in the Perioperative Period</td>
<td>873</td>
</tr>
<tr>
<td>G. Galimberti, and R. Muchada</td>
<td></td>
</tr>
<tr>
<td>Priorities and Optimization of Care in the Elderly – Minimizing Disability</td>
<td>885</td>
</tr>
<tr>
<td>J.H. Silverstein</td>
<td></td>
</tr>
<tr>
<td>Surgery in the Elderly – Outcome and Complication Pattern</td>
<td>893</td>
</tr>
<tr>
<td>L.S. Rasmussen</td>
<td></td>
</tr>
<tr>
<td>Perioperative Challenges in Mentally Handicapped Patients</td>
<td>903</td>
</tr>
<tr>
<td>J. Ruprecht</td>
<td></td>
</tr>
<tr>
<td>Controversial Aspects in Perioperative Medicine</td>
<td>909</td>
</tr>
<tr>
<td>G. Galimberti</td>
<td></td>
</tr>
<tr>
<td>Postoperative Pain Challenge</td>
<td>923</td>
</tr>
<tr>
<td>F. Giunta, and A. Paolicchi</td>
<td></td>
</tr>
<tr>
<td>The Challenge of Postoperative Analgesia</td>
<td>933</td>
</tr>
<tr>
<td>N. Rawal</td>
<td></td>
</tr>
<tr>
<td>The Management of Postoperative Pain – Drugs and Anaesthetic Techniques</td>
<td>945</td>
</tr>
<tr>
<td>G. Galimberti</td>
<td></td>
</tr>
<tr>
<td>Postoperative Analgesia in Ambulatory Surgery</td>
<td>967</td>
</tr>
<tr>
<td>N. Rawal</td>
<td></td>
</tr>
<tr>
<td>Cost-Effectiveness of Postoperative Pain Management</td>
<td>973</td>
</tr>
<tr>
<td>N. Rawal</td>
<td></td>
</tr>
<tr>
<td>Neurologic Complications in Cardiac Surgery, is it Predictable?</td>
<td>983</td>
</tr>
<tr>
<td>J.O.C. Auler</td>
<td></td>
</tr>
</tbody>
</table>
# Table of Contents

## Myocardial Revascularization with Laser
J.O.C. Auler, L.A. Dallan, and S. Almeida de Oliveira

## Advances in Anaesthesia Techniques for Children
A. Sarti, R. Scarpa, and S. Banti

## Pain Management in Children
P. Busoni, A. Messeri

## How Can Anaesthetists Modify Stress Response During the Perioperative Period?
V. Novak-Jankovic, V. Paver-Erzen

### OBSTETRICS

## Trends in Obstetric Anaesthesia
G. Lyons

## Inhalation Anaesthesia for Caesarean Section
C. Melloni

## Principles of Epidural Dosing in Labour
G. Lyons

## Epidural, Spinal or Combined Spinal Epidural for Caesarean Section
I.F. Russell

## Do We Need a Test Dose for Epidural Anaesthesia and Analgesia in Obstetrics?
G. Capogna, and M. Camorcia

## Complications in Obstetric Anaesthesia
C. Melloni

## The Obstetric Patient in Intensive Care: Causes of Admission and Important Considerations
V. Robson, J.A. Crowhurst, and S.J. Brett

## High Dependency Unit in the Obstetric Department
I. Smilov, I. Trayanov, and I. Kovachev

## Obstetric Anaesthesia and Maternal Morbidity and Mortality
I.F. Russell

## Disseminated Intravascular Coagulation in the Obstetric Patient
S. Mangione, and A. Giarratano

## Cardiopulmonary Resuscitation in the Parturient
J. Douglas

## Cardiopulmonary Resuscitation in the Newborn
D. Trevisanuto, and F. Zacchello

## Legal and Ethical Implications of Obstetric Anaesthesia
J. Douglas

## INDEX

---

991

1007

1015

1025

1037

1043

1059

1065

1081

1095

1115

1127

1135

1151

1159

1165

1175

1187
Authors Index

Ajqmone Cat C.
Department of Anaesthesia and Intensive Care, S. Camillo-Forlanini Hospital, Rome (Italy)

Alexander R.
Department of Anaesthesia and Intensive Care, Worcester Acute Hospitals NHS Trust, The Worcester Royal Infirmary, Worcester (U.K.)

Allaria B.
Intensive Care Unit, National Institute for the Study and Treatment of Tumours, Milan (Italy)

Almeida de Oliveira S.
Heart Thoracic Division, Heart Institute, FMUSP Clinical Hospital, São Paulo (Brazil)

Auler J.O.C.
Department of Anaesthesiology, Heart Institute, FMUSP Clinical Hospital, São Paulo (Brazil)

Banti S.
Department of Anaesthesia and Intensive Care, IRCCS Burlo Garofolo Hospital, Trieste (Italy)

Baumgartner C.
Department of Anaesthesia and General Intensive Care Medicine, University of Vienna, Vienna (Austria)

Berlot G.
Department of Clinical Sciences, Section of Anaesthesia, Intensive Care and Pain Clinic, Trieste University School of Medicine, Trieste (Italy)

Bigatello L.M.
Department of Anaesthesia and Critical Care, Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts (U.S.A.)

Biolo G.
Department of Clinical, Morphological and Technological Sciences, Division of Internal Medicine, University of Trieste, Trieste (Italy)

Bird F.M.
Bird Institute of Biomedical Technology, Sandpoint, Idaho (U.S.A.)

Blanch L.
Critical Care Centre, Sabadell Hospital, Parc Taulí University Institute, Sabadell (Spain)

Boezeman H.
Department of Clinical Neurophysiology, St. Antonius Hospital, Nieuwegein (The Netherlands)

Boyd O.F.
Department of Intensive Care, The Royal Sussex County Hospital, Brighton (U.K.)

Brandolese R.
Intensive Care Unit, Multidisciplinary Rehabilitation Centre, Padua City Hospital, Padua (Italy)
Brett S.J.
Department of Anaesthesia and Intensive Care, Hammersmith and Queen Charlotte’s Hospital, London (U.K.)

Brisinda G.
Department of Surgery, Division of Organ Transplantation, Catholic University, University Hospital “A. Gemelli” and CNR, Rome (Italy)

Busoni P.
Department of Anaesthesia and Intensive Care, A. Meyer Hospital, Florence (Italy)

Caironi P.
Department of Anaesthesia and Intensive Care, Milan University, Maggiore Hospital, Milan (Italy)

Camorcia M.
Department of Anaesthesia, AfaR – CRCCS Fatebenefratelli General Hospital, Rome (Italy)

Candiani A.
Institute of Anaesthesia and Intensive Care, University of Brescia, Spedali Civili, Brescia (Italy)

Capogna G.
Department of Anaesthesia, AfaR – CRCCS Fatebenefratelli General Hospital, Rome (Italy)

Carli F.
Department of Anaesthesia, McGill University Health Centre, Montreal, Quebec (Canada)

Castagneto M.
Department of Surgery, Division of Organ Transplantation, Catholic University, University Hospital “A. Gemelli” and CNR, Rome (Italy)

Cavaglià M.
Department of Anaesthesiology and Intensive Care, University “A. Avogadro” of Eastern Piedmont, Novara (Italy)

Cerchiari E.
Department of Anaesthesia and Intensive Care, S. Camillo-Forlanini Hospital, Rome (Italy)

Chierego M.L.
Department of Clinical Sciences, Section of Anaesthesia, Intensive Care and Pain Clinic, Trieste University School of Medicine, Trieste (Italy)

Colombo G.
Department of Clinical and Biologic Sciences, Insubria University, Varese (Italy)

Crowhurst J.A.
Department of Anaesthesia and Intensive Care, Hammersmith and Queen Charlotte’s Hospital, London (U.K.)

D’Amato L.
Department of Surgical, Anaesthesiological and Emergency Sciences, Naples University “Federico II”, Naples (Italy)
Dallan L.A.
Heart Thoracic Division, Heart Institute, FMUSP Clinical Hospital, São Paulo (Brazil)

De Blasio E.
Intensive Care Unit “Marchiafava”, Emergency Department, S. Camillo-Forlanini Hospital, Rome (Italy)

de Haan P.
Department of Anaesthesiology, Onze Lieve Vrouwe Gasthuis, Amsterdam (The Netherlands)

De Robertis E.
Department of Anaesthesia and Intensive Care, Naples University “Federico II”, Naples (Italy)

Della Corte F.
Department of Anaesthesiology and Intensive Care, University “A. Avogadro” of Eastern Piedmont, Novara (Italy)

Douglas J.
Department of Anaesthesia, British Columbia’s Women’s Hospital and University of British Columbia, Vancouver, British Columbia (Canada)

Drakulovic M.
Respiratory Intensive Care Unit, Department of Pneumology, Clinical Institute of Pneumology and Thoracic Surgery, Clinical Hospital, Institute of Biomedical Investigation Augusti Pi i Sunyer, University of Barcelona, Barcelona (Spain)

Fernandes C.R.
Department of Anaesthesiology, Heart Institute, FMUSP Clinical Hospital, São Paulo (Brazil)

Finsterer U.
Department of Anaesthesiology, Ludwig-Maximilians University, Munich (Germany)

Flabouris A.
Intensive Care Unit, Liverpool Hospital, University of New South Wales, Sydney (Australia)

Fontanesi L.
Department of Clinical Sciences, Section of Anaesthesia, Intensive Care and Pain Clinic, Trieste University School of Medicine, Trieste (Italy)

Frova G.
Department of Anaesthesia and Intensive Care, “Spedali Civili” Hospital, Brescia (Italy)

Galiberti G.
Department of Clinical Sciences, Section of Anaesthesia, Intensive Care and Pain Clinic, Trieste University School of Medicine, Trieste (Italy)

Gamberoni C.
Department of Anaesthesiology and Intensive Care, Insubria University, Varese (Italy)

Gattinoni L.
Department of Anaesthesia and Intensive Care, Milan University, Maggiore Hospital, Milan (Italy)
Giarratano A.
Department of Anaesthesiology and Intensive Care, Palermo University, Palermo (Italy)

Girardis M.
Department of Anaesthesia and Intensive Care, Modena General Hospital, Modena (Italy)

Giunta F.
Department of Anaesthesiology and Intensive Care, Pisa University, Pisa (Italy)

Gordini G.
Department of Intensive Care, 118 – Maggiore Hospital, Bologna (Italy)

Grocott M.
Surgical Outcomes Research Centre, University College, London (U.K.)

Gullo A.
Department of Clinical Sciences, Section of Anaesthesia, Intensive Care and Pain Clinic, Trieste University School of Medicine, Trieste (Italy)

Gurman G.M.
Division of Anaesthesiology, Soroka Medical Centre and Faculty of Health Sciences, Ben Gurion University of the Negev, Beer Sheva (Israel)

Hammond M.
Centre for Anaesthesia, University College, London (U.K.)

Hammerle A.F.
Department of Anaesthesia and General Intensive Care Medicine, University of Vienna, Vienna (Austria)

Hedenstierna G.
Department of Clinical Physiology, University Hospital, Uppsala (Sweden)

Iliievich U.M.
Department of Anaesthesiology and General Intensive Care, University of Vienna, Vienna (Austria)

Jakob S.M.
Department of Intensive Care Medicine, University Hospital, Bern (Switzerland)

Jonson B.
Department of Clinical Physiology, University Hospital, Lund (Sweden)

Josten C.
Department of Traumatology, University of Leipzig, Leipzig (Germany)

Kalkman C.J.
Department of Anaesthesiology, University Hospital, Utrecht (The Netherlands)

Kaplan L.J.
Departments of Surgery and Emergency Medicine, Medical College of Pennsylvania-Hahnemann University, Philadelphia, Pennsylvania (U.S.A.)

Kellum J.A.
Department of Critical Care Medicine, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania (U.S.A.)
Kesecioglu J.
Department of Intensive Care, University of Amsterdam, Academic Medical Centre, Amsterdam (The Netherlands)

Kovachev I.
Department of Anaesthesia and Intensive Care, University Hospital of Obstetrics and Gynaecology, Medical University, Sofia (Bulgaria)

Lachmann B.
Department of Anaesthesiology, Erasmus University Rotterdam, Rotterdam (The Netherlands)

Lapinsky S.E.
Intensive Care and Division of Respirology, Mount Sinai Hospital, Toronto, Ontario (Canada)

Latronico N.
Institute of Anaesthesiology and Intensive Care, University of Brescia, Spedali Civili, Brescia (Italy)

Lavoie J.-P.
School of Veterinary Medicine, University of Montreal, Ste Hyacinthe, Quebec (Canada)

Lingnau W.
Department of Anaesthesia and Critical Care Medicine, Leopold-Franzens-University, Innsbruck (Austria)

Lips J.
Department of Anaesthesiology, Academic Medical Centre, University of Amsterdam, Amsterdam (The Netherlands)

Lombardini C.
Department of Anaesthesia and Intensive Care, Modena General Hospital, Modena (Italy)

Lucangelo U.
Department of Clinical Sciences, Section of Anaesthesia, Intensive Care and Pain Clinic, Trieste University School of Medicine, Trieste (Italy)

Lumb P.D.
Department of Anaesthesiology, Keck School of Medicine at USC, Los Angeles, California (U.S.A.)

Lyons G.
Obstetric Anaesthesia, St. James’ University Hospital, Leeds (U.K.)

Machata A.-M.
Department of Anaesthesiology and General Intensive Care, University of Vienna, Vienna (Austria)

Magder S.
Department of Medicine and Physiology, McGill University Hospital Centre, Montreal, Quebec (Canada)

Mangione S.
Department of Anaesthesiology and Intensive Care, Palermo University, Palermo (Italy)
Maria G.
Department of Surgery, Division of Organ Transplantation, Catholic University, University Hospital “A. Gemelli” and CNR, Rome (Italy)

Martin J.G.
Meakins-Christie Laboratories, Department of Medicine, McGill University, Montreal, Quebec (Canada)

McKeating E.G.
Department of Neuroanaesthesia and Critical Care, The Royal Preston Hospital, Preston (U.K.)

Melloni C.
Department of Anaesthesia and Intensive Care, Faenza Hospital, Faenza (Italy)

Menarini M.
Department of Intensive Care, 118 – Maggiore Hospital, Bologna (Italy)

Messeri A.
Department of Anaesthesia and Intensive Care, A. Meyer Hospital, Florence (Italy)

Minucci S.
Interventional Radiology, Department of Radiology, S. Camillo Forlanini Hospital, Rome (Italy)

Morgan T.J.
Intensive Care Facility, Royal Brisbane Hospital, Brisbane, Queensland (Australia)

Muchada R.
Department of Anaesthesia and Intensive Care, Eugène André Hospital, Lyon (France)

Muggia-Sullam M.
Department of Surgery, Hadassah Hebrew University Medical Centre, Jerusalem (Israel)

Murias G.
Critical Care Centre, Sabadell Hospital, Parc Taulí University Institute, Sabadell (Spain)

Mythen M.G.
Centre for Anaesthesia, University College, London (U.K.)

Nardi G.
Intensive Care Unit “Marchiafava”, Emergency Department, S. Camillo-Forlanini Hospital, Rome (Italy)

Novak-Jankovic V.
Clinical Department of Anaesthesiology and Intensive Care, University Medical Centre, Ljubljana (Slovenia)

Paolicchi A.
Department of Anaesthesia and Intensive Care, Pisa Hospital, Pisa (Italy)

Parr M.J.A.
Intensive Care Unit, Liverpool Hospital, University of New South Wales, Sydney (Australia)

Pasetto A.
Department of Anaesthesia and Intensive Care, Modena General Hospital, Modena (Italy)
Paver Eržen V.
Clinical Department of Anaesthesiology and Intensive Care, University Medical Centre, Ljubljana (Slovenia)

Pellis T.
Department of Clinical Sciences, Section of Anaesthesia, Intensive Care and Pain Clinic, and The Institute of Critical Care Medicine, Palm Springs, California (U.S.A.)

Pelosi P.
Department of Anaesthesiology and Intensive Care, Insubria University, Varese (Italy)

Penney D.J.
Intensive Care Unit, Liverpool Hospital, University of New South Wales, Sydney (Australia)

Pino G.P.
Diagnostic Cardiology, Department of Cardiology, S. Camillo Forlanini Hospital, Rome (Italy)

Pittarello D.
Department of Pharmacology and Anaesthesiology, Padua General Hospital, Padua (Italy)

Poelma D.L.H.
Department of Anaesthesiology, Erasmus University Rotterdam, Rotterdam (The Netherlands)

Pozzi Mucelli F.
Radiology Department, University of Trieste, Trieste (Italy)

Primadei M.
Department of Pharmacology and Anaesthesiology, Padua General Hospital, Padua (Italy)

Rasmussen L.S.
Department of Anaesthesia, Copenhagen University Hospital, Rigshospitalet, Copenhagen (Denmark)

Rawal N.
Department of Anaesthesiology and Intensive Care, Örebro Medical Centre Hospital, Örebro (Sweden)

Rehm M.
Department of Anaesthesiology, Ludwig-Maximilians University, Munich (Germany)

Resta M.
Intensive Care Unit, National Institute for the Study and Treatment of Tumours, Milan (Italy)

Ricci Z.
Department of Nephrology, St. Bortolo Hospital, Vicenza (Italy)

Riccioni L.
Intensive Care Unit “Marchiafava”, Emergency Department, S. Camillo-Forlanini Hospital, Rome (Italy)

Robson V.
Department of Anaesthesia and Intensive Care, Hammersmith and Queen Charlotte’s Hospital, London (U.K.)
Rocco P.R.M.
Laboratory of Respiration Physiology, Carlos Chagas Filho Biophysics Institute, Federal University of Rio de Janeiro, Centre for Health Sciences, Rio de Janeiro (Brazil)

Ronco C.
Department of Nephrology, St. Bortolo Hospital, Vicenza (Italy)

Ruprecht J.
Department of Anaesthesiology, University Hospital Rotterdam, Rotterdam (The Netherlands)

Russell I.F.
Department of Anaesthesia, Hull Royal Infirmary, Hull (U.K.)

Sarti A.
Department of Anaesthesia and Intensive Care, IRCCS Burlo Garofolo Hospital, Trieste (Italy)

Scarpa R.
Department of Anaesthesia and Intensive Care, IRCCS Burlo Garofolo Hospital, Trieste (Italy)

Scheibner L.
Intensive Care Unit, University of Leipzig, Leipzig (Germany)

Schepens M.A.
Department of Cardiotoracic Surgery, St. Antonius Hospital, Nieuwegein (The Netherlands)

Schmidt G.A.
Department of Clinical Medicine and Anaesthesia/Critical Care, University of Chicago, Chicago, Illinois (U.S.A.)

Schreiter D.
Intensive Care Unit, University of Leipzig, Leipzig (Germany)

Servillo G.
Department of Anaesthesia and Intensive Care, Naples University “Federico II”, Naples (Italy)

Sganga G.
Department of Surgery, Division of Organ Transplantation, Catholic University, University Hospital “A. Gemelli” and CNR, Rome (Italy)

Silverstein J.H.
Department of Anaesthesiology, Mount Sinai School of Medicine, New York (U.S.A.)

Smilov I.
Department of Anaesthesia and Intensive Care, University Hospital of Obstetrics and Gynaecology, Medical University, Sofia (Bulgaria)

Sorbara C.
Department of Pharmacology and Anaesthesiology, Padua General Hospital, Padua (Italy)

Spiss C.K.
Department of Anaesthesiology and General Intensive Care, University of Vienna, Vienna (Austria)
Stefini R.
Institute of Neurosurgery, University of Brescia, Spedali Civili, Brescia (Italy)

Story D.A.
Department of Anaesthesia, Austin and Repatriation Medical Centre, Heidelberg, Victoria (Australia)

Sutcliffe A.J.
Department of Anaesthesia and Intensive Care, Queen Elizabeth Hospital, Birmingham (U.K.)

Tabor T.
Advisor to Florida Community College, Respiratory Physiology Programme, Jacksonville, Florida (U.S.A.)

Tang W.
The University of Southern California, Keck School of Medicine, Los Angeles, California (U.S.A.)

Tatschl C.
Department of Anaesthesia and General Intensive Care Medicine, University of Vienna, Vienna (Austria)

Tomasini A.
Department of Clinical Sciences, Section of Anaesthesia, Intensive Care and Pain Clinic, Trieste University School of Medicine, Trieste (Italy)

Torres A.
Respiratory Intensive Care Unit, Department of Pneumology, Clinical Institute of Pneumology and Thoracic Surgery, Clinical Hospital, Institute of Biomedical Investigation Augusti Pi i Sunyer, University of Barcelona, Barcelona (Spain)

Torri G.
Department of Anaesthesia and Intensive Care, University of San Raffaele, Milan (Italy)

Trayanov I.
Department of Anaesthesia and Intensive Care, University Hospital of Obstetrics and Gynaecology, Medical University, Sofia (Bulgaria)

Trevisanuto D.
Department of Paediatrics, Padua University Medical School, Padua (Italy)

Tufano R.
Department of Anaesthesia and Intensive Care, Naples University “Federico II”, Naples (Italy)

van Dongen E.P.
Department of Anaesthesiology and Intensive Care, St. Antonius Hospital, Nieuwegein (The Netherlands)

Ventafridda V.
Floriani Foundation, Milan (Italy)

Vignazia G.L.
Department of Anaesthesiology and Intensive Care, University “A. Avogadro” of Eastern Piedmont, Novara (Italy)
Villagra A.
Critical Care Centre, Sabadell Hospital, Parc Taulí University Institute, Sabadell (Spain)

Volpe N.G.
Department of Anaesthesia and Intensive Care, Worcester Acute Hospitals NHS Trust, The Worcester Royal Infirmary, Worcester (U.K.)

Weksler N.
Division of Anaesthesiology, Soroka Medical Centre and Faculty of Health Sciences, Ben Gurion University of the Negev, Beer Sheva (Israel)

Zacchello F.
Department of Paediatrics, Padua University Medical School, Padua (Italy)

Zin W.A.
Laboratory of Respiration Physiology, Carlos Chagas Filho Biophysics Institute, Federal University of Rio de Janeiro, Centre for Health Sciences, Rio de Janeiro (Brazil)


Abbreviations

\( \gamma \), surface tension
\( \gamma GT \), gamma-gluamyltranspeptidase
AAST, American Association for the Surgery of Trauma
ABF, aortic blood flow
ABS, apparent bicarbonate space
ACEIs, angiotensin-converting enzyme inhibitors
ACOG, American College of Obstetricians Gynecologists
ACTH, adrenocorticotrophic hormone
ADH, antidiuretic hormone
ADL, activities of daily living
AED, automatic external defibrillator
AFE, amniotic fluid embolism
AG, anion gap
AIDS, acquired immunodeficiency syndrome
AIS, abbreviated injury scale
ALI, acute lung injury
ALS, advances life support
AMPA, alpha-amino-3-hydroxy-5-methyl-4-isoxazolepropionate
ANH, acute normovolemic haemodilution
ANS, autonomic nervous system
AP, alkaline phosphatase
AP, arterial pressure
APACHE-II, Acute Physiology And Chronic Health Evaluation II
APOE, apolipoprotein E
APRV, airway pressure release ventilation
APS, Acute Pain Service
ARDS, acute respiratory distress syndrome
ARF, acute respiratory failure
ASA, American Society of Anesthesiologists
ASPIDS, aspirate dead space gas from the trachea
AT, abdominal trauma
ATOT, total weak acid concentration
ATS, American Thoracic Society
BAI, blunt aortic injury
BCI, blunt cardiac injury
BCT, blunt cardiac trauma
BD, base deficit
BE, base excess
BEua, base excess caused by unmeasured strong anions
BP, blood pressure
BPI, bactericidal/permeability increasing protein
BUN, blood urea nitrogen
C/S, caesarean section
CAGB, coronary artery bypass grafting
CBF, cerebral blood flow
CCS, Canadian Cardiovascular Society
CDC, Centres for Disease Control
CEGA, combined epidural-general anaesthesia
CEMD, Confidential Enquiries into Maternal Deaths
CEMDEW or CEMDUK, Confidential Enquiry into maternal deaths of England and Wales (later United Kingdom)
CFAM, cerebral function analysing monitor
ClCR, creatinine clearance
CMV, continuous mechanical ventilation
CO, cardiac output
COP, colloid osmotic pressure
COPA, cuffed oropharyngeal airway
COPD, chronic obstructive pulmonary disease
COX, cyclooxygenase
CPAP, continuous positive airway pressure
CPB, cardiopulmonary bypass
CPP, cerebral perfusion pressure
CPR, cardiopulmonary resuscitation
CPRi, cardiopulmonary risk index
CRF, corticotropin releasing factor
CSA, continuous spinal anaesthesia
CSE, combined spinal epidural
CSF, cerebrospinal fluid
Cst, static compliance
CT, computed tomography
CTC, computed tomography of the chest
CTD, Common Technical Document
c-Tnl, cardiac troponin I
CVI, ventilator/computer interface
CVP, central venous pressure
D/FRC, dynamic functional residual capacities
D, dialysance
DAP, diastolic arterial pressure
DCA, dichloroacetate
DCS, damage control surgery
DIC, disseminated intravascular coagulation
DKA, diabetic ketoacidosis
DO₂, oxygen delivery
DPL, diagnostic peritoneal lavage
DVDR, dynamic volumetric diffusive respiration
DVT, deep vein thrombosis
E, expiratory time
EAA, epidural anaesthesia and analgesia
EBM, evidence-based medicine
ECG, electrocardiogram
ECMO, extracorporeal membrane oxygenation
ECV, extracellular volume
ED, emergency department
EE, energy expenditure
EF, external fixation
EFPIA, European Federation of Pharmaceutical Industries and Associations
EFTA, European Free Trade Area
ECG, electrocardiogram
ELSO, Extracorporeal Life Support Organization
EMS, emergency medical services
ER, extraction ratio
ESBL, extended-spectrum beta-lactamase
ESG, endovascular stent-grafting
Est: cw, elastance of the chest wall
FAST, focused abdominal sonogram for trauma
FDA, Food and Drug Administration
FF, filtration fraction
FiO₂, fraction inspired oxygen
FMH, foetomaternal haemorrhage
FRC, functional residual capacity
GA, general anaesthesia
GCS, Glasgow Coma Scale
GDM, gestational diabetes mellitus
GER, gastroesophageal reflux
GFR, glomerular filtration rate
GIT, gastrointestinal tract
GOS, Glasgow Outcome Scale
GOSE, Glasgow Outcome Scale Extended
H+, hydrogen ions
HA-1A, human IgM monoclonal antibody
HARM, Harborview assessment for risk of mortality
HCMA, hyperchloraemic metabolic acidosis
HCO₃⁻, bicarbonate ions
HDF, haemodiafiltration
HDU, High Dependency Units
HES, hydroxyethyl starch
HF, haemofiltration
HFPV, high frequency percussive ventilation
HFV, high frequency ventilation
HGH, human growth hormone
HICPAC, Hospital Infection Control Advisory Committee
HPT, haemopneumothorax
HPV, hypoxic pulmonary vasoconstriction
HR, heart rate
HT, haemothorax
HU, Hounsfield units
I:E, inspiration expiration ratio
IACS, intra-abdominal compartment syndrome
IADL, independent activities of daily living
IAP, intra-abdominal pressure
IASP, International Association for the Study of Pain
IBD, inflammatory bowel disease
ICD-9-CM, international classification of disease – 9th Rev.
ICH, International Conference on Harmonisation
ICISS, international classification disease-9 based injury severity score
ICP, intracranial pressure
ICU, intensive care unit
IFPMA, International Federation of Pharmaceutical Manufacturers Association
IL, interleukin
ILCOR, International Liaison Committee on Resuscitation
IMN, intramedullary nail fixation
IMV, intermittent mandatory ventilation
INCB, International Narcotics Control Board

IP, intracellular pH

IPPB, intermittent positive pressure breathing

IPV®, intrapulmonary percussive ventilation

ISPOCD, International Study of Postoperative Cognitive Dysfunction

ISS, Injury Severity Score

IV, intravenous

JCAHO, Joint Commission on Accreditation of Healthcare Organizations

JHRCs, Johns Hopkins Risk Classification System

JPMA, Japan Pharmaceutical Manufacturers Association

LA, local anaesthetic

LAR, late allergic response

LIP, lower inflection point

LMA, laryngeal mask airway

LPS, lipopolysaccharide

LV, left ventricle

LVETi, left ventricular ejection time indexed to the HR

LVSWI, left ventricular stroke work index

MAC, minimum alveolar concentration

MAP, mean arterial pressure

MH, malignant hyperthermia

MHLW, Ministry of Health, Labor and Welfare, Japan

MHP, mentally handicapped patients

MI, myocardial infarction

MODS, multiple organ dysfunction syndrome

MOF, multiple organ failure

MRS, magnetic resonance spectroscopy

MRUPL, minimal required upper pressure limit

MT, major trauma

MTR, mass transfer rate

MV, mechanical ventilation

MVA, motor vehicle accidents

MV02, myocardial oxygen consumption

NACA-scale, National Advisory Committee of Aeronautics scale

NAIS, non adrenergic inhibitory system

NGT, nasogastric tube

NIBP, non-invasive blood pressure

NICO, non-invasive cardiac output

NICU, neuro-intensive care unit

NIH, National Institute of Health

NISS, new injury severity score

NMDA, N-methyl-D-aspartate

NNIS, National Nosocomial Infections Surveillance

NO, nitric oxide

NP, nosocomial pneumonia

NPE, neurogenic pulmonary oedema

NSAIDs, non-steroidal anti-inflammatory drugs

NTB, necrotising tracheo-bronchitis

OPS, Orthogonal Polarization Spectral

OR, operating room

P, pressure

PA, pulmonary artery

PACU, Postanaesthesia Care Unit

PAD, public access defibrillation

PAF, platelet-aggregating factor

PAFS, preoperative assessment of fitness score

PAI-1, plasminogen activator inhibitor-1

Paw, airway pressure

PAWP, peak airway pressure

PCA, patient-controlled analgesia

PCBF, pulmonary capillary blood flow

PCEA, patient-controlled epidural analgesia

PCV, packed cell volume

PCWP, pulmonary capillary wedge pressure

PDH, pyruvate dehydrogenase

PDPH, post dural puncture headache

PDSA, plan-do-study-act

PE, pulmonary embolism

PEA, pulseless electrical activity

PEEP, positive end expiratory pressure

PEEPi, intrinsic positive end-expiratory pressure

PEPi, pre-ejection period indexed to the HR

Pes, esophageal pressure

PET, positron emission tomography

PGE2, prostaglandin

pHi, intramucosal pH

PhRMA, Pharmaceutical Research and Manufacturers of America

PIE, pulmonary interstitial emphysema

PMN, polymorphonuclear granulocytes

POCD, postoperative cognitive dysfunction

POD, postoperative day
Abbreviations

PONV, postoperative nausea and vomiting
POPC, paediatric overall performance category
PPF, plasma protein fraction
PPMs, potentially pathogenic micro-organisms
PPV, positive pressure ventilation
PRC, packet red cells
PRCO, partial rebreathing for cardiac output measurement
PRMD, post-resuscitation myocardial dysfunction
PT, percutaneous tracheostomy
PT, pneumothorax
PT, prothrombin time
PTA, post-traumatic amnesia
PTCA, percutaneous transluminal coronary angiography
PTS, Paediatric Trauma Score
PTT, partial thromboplastin time
P-V, pressure-volume
PVC, premature ventricular contraction
PvCO₂, venous carbon dioxide tension
PVE, plasma volume expansion
r, radius
RBC, red blood cell
RBF, renal blood flow
rBPI, recombinant bactercidal/permeability increasing protein
REACT, rapid early action for coronary treatment
rhGH, recombinant human growth hormone
Rmax,cw, contribution of total resistance of the chest wall
Rmax,L, increase in total resistance of the lung
Rmax,rs, increase in total resistance of the respiratory system
ROC, receiver operating characteristic curve
ROSC, return to spontaneous circulation
RPF, renal plasma flow
RR, respiration rate
rSO₂, regional oxygen saturation
r-tPA, recombinant tissue plasminogen activator
RTS, Revised Trauma Score
RVEDV, right ventricular end diastolic volume
RVSWI, right ventricular stroke work index
SA, status asthmaticus
SAP, systolic arterial pressure
SBCO₂, single breath CO₂
SCBF, spinal cord blood flow
SCPP, spinal cord perfusion pressure
SCUF, slow continuous ultra filtration
SDD, selective digestive decontamination
SEP, somatosensory evoked potentials
SGOT-SGTP, serum-glutamic-oxalacetic transaminase and serum glutamic-pyruvic transaminase
SID, strong ion difference
SIDa, “apparent” SID
SIDe, effective SID
SIG, strong ion gap
SIMV, synchronous inspiratory intermittent mandatory ventilation
SIRS, systemic inflammatory response syndrome
SjO₂, oxygen saturation in the jugular vein
SLTA, severe life-threatening asthma
SPECT, single photon emission tomography
SSA, single shot spinal anaesthesia
SSEP, somatosensory evoked potentials
STI, systolic time interval
STS, Society of Thoracic Surgery
SV, stroke volume
SVRI, systemic vascular resistance index
SW, stroke work
TAAA, thoracoabdominal aortic aneurysm
TAE, transcatheter arterial embolization
T-AT, thrombin-antithrombin III
TBI, traumatic brain injury
TBW, total body water
TCD, trans-cranial Doppler
TCI, target controlled infusion
tcMEP, transcranial electrical stimulation
TDCO, thermodilution cardiac output measurement
TED, transoesophageal echodoppler
TEE, transesophageal echocardiography
TFPI, tissue factor and pathway inhibitor
TGI, tracheal gas insufflation
THAM, Tris-hydroxymethyl aminomethane
Abbreviations

TIVA, total intravenous anaesthesia
TLT, translaryngeal tracheostomy
TMRL, transmyocardial revascularization laser
TNF, tumour necrosis factor
TNFα, tumour necrosis factor-α
TPN, total parenteral nutrition
TPT, hypertensive pneumothorax
TRISS, trauma revised injury score
TS, Trauma Score
TSVR, total systemic vascular resistance
TTS, trauma thoracic severity score
TV, tidal volume
TX, thromboxane
UHDDS, Uniform Health Discharge Data Set
UI-D, uterine incision-delivery interval
UIP, upper inflection point
UNESCO, United Nations Educational, Scientific, and Cultural Organization
UOP, urine output
US, ultrasound
V/Q, ventilation/perfusion matching
VAP, ventilator associated pneumonia
VAS, visual analogue scale
Vc, central compartment
VCO2, CO2 production
VD/VT, total dead space
VF, ventricular fibrillation
VILI, ventilatory-induced lung injury
VISA, vancomycin-intermediate S. aureus
VO2, oxygen consumption
VPS, verbal pain scale
VRE, enterococci with resistance to vancomycin
VRSA, vancomycin-resistant S. aureus
VT, tidal volume
VT, ventricular tachycardia
WBC, white blood cell count
WHO, World Health Organization
W1aw, work done to overcome the airway resistance
W1dyn.rs, dynamic components of lung and chest wall
W1PEEP, work due to PEEPi
W1rs, inspiratory work done on the respiratory system
W1st.rs, static components of lung and chest wall
δPes, difference in esophageal pressure
ΔPti, difference in tracheal pressure
ΔW1rs, work due to the viscoelastic properties of the thoracic tissues and/or time constant inequality within the lungs
PREFACE
APICE 2001

APICE 2001 provides continuous updates of topics pertaining to critical care medicine. The foundations of this fascinating branch of medicine include basic and technological research, the progress of computer technology and the success of clinical pharmacology. Critical care medicine is no longer considered a pioneer activity for few experts, but a branch in which there is an interdisciplinary cooperation among researchers, health-care operators, nurses and technical staff who put their competence at the disposal of patients whose vital functions are potentially and often severely compromised. This edition has the objective of providing researchers and health-care operators with the most recent achievements in some important sectors. The volume is divided into six sections.

The first part is dedicated to topics which are key elements of critical care. It includes personal contributions on the learning process in the treatment of critically ill patients and updates on the monitoring of vital functions, ethical and legal aspects in the field of perioperative medicine, as well as some guidelines in the treatment of patients in line with the declaration of Helsinki.

The second section is dedicated to the lung. In particular, it includes some experimental and clinical experiences on important topics such as asthma and the experimental Acute Lung Injury model. Other important aspects which can improve the clinical approach to patients undergoing artificial ventilation are the need to optimise the ratio of ventilation to perfusion, the importance of alveolar recruitment and the role of ventilation in semirecumbency. This section also includes some interesting experiences regarding the monitoring of the respiratory function and the application of some ventilation support techniques with permissive hypercapnia and high-frequency percussive ventilation.

The third part is dedicated to trauma, an ever topical and important subject which, together with cardiovascular diseases, represents the very core of the emergency department. The role of the latter as training structure becomes increasingly important, both for the different competences it includes and the advanced technology which can guarantee high care standards.

The fourth section is dedicated to the acid-base balance, which is analysed in all its aspects, starting from the modern concept of homoeostasis and the physiopathological consequences of the different disorders of the acid-base system. Particularly important are the chapters regarding fluid therapy in the perioperative period, lactic acidosis and acid-base disorders during renal replacement therapy. In addition, the monitoring of intragastric pH provides important evidence of splanchnic dysfunction. The last chapter regards the never solved controversy crystalloids vs. colloids.
The fifth part is dedicated to perioperative medicine, which is an integral part of Critical Care. The most recent progresses of the organisational and clinical sectors are reported. In particular some chapters are dedicated to the treatment of postoperative pain.

The sixth section is dedicated to obstetrics and deals with the need to customize the different anaesthetic techniques. Various authoritative experiences in the sector of inhalation anaesthesia and regional anaesthesia techniques in obstetrics and delivery assistance are reported. The importance of ensuring the utmost safety for mother and baby is stressed. Disseminated intravascular coagulation is one of the main complications. The final chapters are dedicated to maternal mortality and morbidity, the first measures of basic and advanced resuscitation both in parturients and newborn babies. Lastly, this section deals with some relevant ethical and legal aspects.

Prof. Antonino Gullo
Trieste 16.11.2001