

A Comprehensive Textbook of
**POSTPARTUM
HEMORRHAGE**

*An Essential Clinical Reference
for Effective Management*

2nd Edition

A Comprehensive Textbook of
**POSTPARTUM
HEMORRHAGE**

*An Essential Clinical Reference
for Effective Management*

2nd Edition

Edited by

Sir Sabaratnam Arulkumaran MD, PhD, FRCS, FRCOG

St George's, University of London, UK

Mahantesh Karoshi MD, MRCOG, DCRCM

Barnet and Chase Farm Hospitals NHS Trust, Barnet, London, UK

Louis G. Keith MD, PhD, FACOG, FRCOG

Northwestern University, Chicago, USA

André B. Lalonde MD, FRCSC, FRCOG

University of Ottawa and McGill University, Ottawa, Canada

Christopher B-Lynch FRCS, FRCOG, D.Univ

Milton Keynes General Hospital NHS Foundation Trust (Oxford Deanery), UK

Published

on behalf of

The Global Library of Women's Medicine

(www.glowm.com)

by

Sapiens Publishing



**SAPIENS
PUBLISHING**

All the authors and editors have contributed to this publication on a strictly charitable basis and have received no remuneration of any kind for their contributions.



Abigail Bloomer, 1970–2001

*This book has been produced and published on a not-for-profit, charitable basis by the Founders of **The Global Library of Women's Medicine** (and of Sapiens Publishing) in*

loving memory of their daughter ABIGAIL BLOOMER, who worked alongside them in medical publishing for a number of years and who sadly died at the early age of 31 from breast cancer in December 2001. Abigail was especially involved in publishing on women's health issues. She is greatly missed.

Whilst this book is being made available via the normal publishing channels in the Western World, it will be supplied free to selected physicians in less-resourced countries. It is also being made available universally free, and in full, on the website of **The Global Library of Women's Medicine** (www.glowm.com).

A wall chart on this topic, designed to inform and support birth assistants, is also being made available.

Published by
Sapiens Publishing Ltd, 32 Meadowbank, London, NW3 3AY, UK
email: info@sapienspublishing.com
www.sapienspublishing.com

Copyright © 2012 Sapiens Publishing Ltd | First edition published October 2006. This edition published in 2012

Although protected by copyright, this book or selected parts of it may be freely copied for educational or charitable purposes. However, neither the whole book nor any part of it may be copied for any kind of commercial purpose.

CIP data or a catalogue record for this book is available from the British Library.
ISBN: 978-0-9552282-7-8

Typeset by AMA DataSet Limited, Preston, Lancashire, UK
Printed and bound by Butler Tanner & Dennis, Frome, Somerset, UK

Contents

The Editors	ix
The Contributors	xi
Foreword	xix
<i>G. Serour and A. B. Lalonde</i>	
Editors' Preface	xxi
<i>Sir S. Arulkumaran, M. Karoshi, L. G. Keith, A. B. Lalonde and C. B-Lynch</i>	
Section 1: Essential 'Must Read' Chapters	
1 Managing the Ten Most Common Life-Threatening Scenarios Associated with Postpartum Hemorrhage	3
<i>M. Karoshi, J. M. Palacios-Jaraquemada and L. G. Keith</i>	
2 Uterovaginal Blood Supply: the S1 and S2 Segmental Concepts and their Clinical Relevance	19
<i>J. M. Palacios-Jaraquemada, M. Karoshi and L. G. Keith</i>	
3 Management of Exsanguinating Patients in Trauma: a Model for Postpartum Hemorrhage	24
<i>J. B. Elterman, G. M. Riha and M. A. Schreiber</i>	
4 Transfusion Management of Obstetric Hemorrhage	30
<i>E. Lockhart</i>	
5 Early Use of Fibrinogen in the Treatment of Postpartum Hemorrhage	45
<i>O. Onwuemene, D. Green and L. G. Keith</i>	
6 New Approaches to Transfusion Therapy for Postpartum Hemorrhage	48
<i>M. J. Paidas</i>	
Section 2: Introduction	
7 Is Postpartum Hemorrhage a Legacy of our Evolutionary Past?	55
<i>E. T. Abrams and J. N. Rutherford</i>	
8 Postpartum Hemorrhage Today: Living in the Shadow of the Taj Mahal	64
<i>A. B. Lalonde, J. Liljestrand, H. Rushwan and P. Okong</i>	
9 Blood Loss: Accuracy of Visual Estimation	71
<i>A. B. Roston, A. L. Roston and A. Patel</i>	
10 Assessing and Replenishing Lost Volume	73
<i>J. G. L. Cockings and C. S. Waldmann</i>	
11 Pitfalls in Assessing Blood Loss and Decision to Transfer	81
<i>B. S. Kodkany, R. J. Derman and N. L. Sloan</i>	
12 Doppler Evaluation of Hemodynamic Changes in Uterine Blood Flow	89
<i>G. Urban, H. Valensise, E. Ferrazzi, P. Beretta, P. Tortoli, L. Bonsignore, S. Ricci, P. Vergani, P. Patrizio and M. J. Paidas</i>	

13	Pathophysiology of Postpartum Hemorrhage and Third Stage of Labor <i>R. U. Khan and H. El-Refaey</i>	94
14	Active Management of the Third Stage of Labor <i>M. P. O'Connell</i>	101
15	Active Management of the Third Stage of Labor: Current Evidence, Instructions for Use and Global Programmatic Activities <i>D. Armbruster, A. Lalonde, S. Engelbrecht and B. Carbonne</i>	113
Section 3: Demographic Considerations		
16	Definitions and classifications <i>A. Coker and R. Oliver</i>	129
17	Definitions, Vital Statistics and Risk Factors: an Overview <i>M. J. Cameron</i>	133
18	Maternal Morbidity and Near Misses: Determining the Real Numbers <i>M. E. Campbell and J. Barrett</i>	147
19	Problems in Determining Accurate Rates of Postpartum Hemorrhage <i>J. C. Bello-Munoz and L. Cabero-Roura</i>	152
20	Maternal Deaths from Major Obstetric Hemorrhage in the UK: Changing Evidence from the Confidential Enquiries (1985–2011) <i>D. Fleming, R. Gangopadhyay, M. Karoshi and S. Arulkumaran</i>	162
21	Declining Mortality Rate from Postpartum Hemorrhage in Japan and Factors Influencing the Changes, 1950–2009 <i>Y. Imaizumi, T. Ikeda and L. G. Keith</i>	169
Section 4: Causation		
22	Hemodynamic Changes in the Uterus and its Blood Vessels in Pregnancy <i>F. Burbank</i>	177
23	Obstetric Trauma <i>D. G. Evans and C. B-Lynch</i>	185
24	Bleeding from the Lower Genital Tract <i>A. Duncan and C. von Widekind</i>	193
25	Acquired and Congenital Hemostatic Disorders in Pregnancy and the Puerperium <i>R. V. Ganchev and C. A. Ludlam</i>	199
26	Vascular Malformations as a Cause of Postpartum Hemorrhage <i>K. Hayes</i>	218
Section 5: Placental Abnormalities		
27	Placental Abnormalities <i>C. E. M. Aiken, M. K. Mehaseb and J. C. Konje</i>	227
28	Management of Placenta Accreta <i>G. Kayem, L. Sentilhes, G. Grangé, T. Schmitz, V. Tsatsaris, D. Cabrol and F. Goffinet</i>	240
29	The Management of Placenta Accreta at Queen's Hospital, Romford, UK <i>M. O. Thompson, C. Otigbah, A. Kelkar, A. Coker, A. Pankhania and S. Kapoor</i>	247
30	Mifepristone and Misoprostol for the Management of Placenta Accreta: an Alternative Approach <i>R. K. Atalla</i>	259
31	One-Step Conservative Surgery for Abnormal Invasive Placenta (Placenta Accreta–Increta–Percreta) <i>J. M. Palacios-Jaraquemada</i>	263
Section 6: Misoprostol		
32	Misoprostol: Theory and Practice <i>M. B. Bellad and S. S. Goudar</i>	275

33	Misoprostol in Practice <i>C. E. Henderson, H. El-Refaey and M. Potts</i>	284
34	Overview of Misoprostol Studies in Postpartum Hemorrhage <i>A. Hemmerling</i>	289
35	Sublingual Misoprostol for the Treatment of Postpartum Hemorrhage <i>R. Dabash, I. Dzuba and B. Winikoff</i>	296
Section 7: Hospital Preparation		
36	Labor Ward Drills <i>M. K. Tipples and S. Paterson-Brown</i>	305
37	Preparedness for Postpartum Hemorrhage: an Obstetric Hemorrhage Equipment Tray <i>T. F. Baskett</i>	314
38	Non-pneumatic Anti-Shock Garments: Clinical Trials and Results <i>S. Miller, J. L. Morris, M. M. F. Fathalla, O. Ojengbede, M. Mourad-Youssif and P. Hensleigh (deceased)</i>	318
39	The Mechanisms of Action of the Non-Pneumatic Anti-Shock Garment <i>A. L. Stenson, S. Miller and F. Lester</i>	331
40	Building Hospital Systems for the Care of Women with Major Obstetric Hemorrhage <i>D. W. Skupski, G. S. Eglinton and I. P. Lowenwirt</i>	341
41	State Mandated Training in Obstetric Hemorrhage: the Illinois Model <i>R. Malapati, A. Patel and E. S. Linn</i>	348
Section 8: Therapy for Atonic Bleeding		
42	Management of Postpartum Hemorrhage at the Community Level at Home <i>N. Prata</i>	353
43	Standard Medical Therapy for Postpartum Hemorrhage <i>J. Unterscheider, F. Breathnach and M. Geary</i>	355
44	Carbetocin for the Management of Postpartum Hemorrhage <i>M. W. Musaba, T. Dey, J. N. Wandabwa and A. D. Weeks</i>	1
45	Intraluminal Pressure Readings whilst Achieving a Positive ‘Tamponade Test’ in the Management of Postpartum Hemorrhage <i>C. Georgiou</i>	369
46	Internal Uterine Tamponade <i>D. Danso and P. W. Reginald</i>	377
47	Balloon Internal Uterine Tamponade: Experience with 39 Patients from a Single Institution <i>S. Ferrazzani, A. Perrelli, C. Piscicelli and S. De Carolis</i>	381
48	Using the Uterine-Specific Bakri Balloon in the Management of Postpartum Hemorrhage: Case Series and Conceptual/Practical Guidelines <i>C. Georgiou</i>	387
49	Embolization and Balloon Catheter Placement <i>K. Choji and T. Shimizu</i>	398
50	The Use of Recombinant Factor VIIa <i>S. Sobieszczyk and G. H. Breborowicz</i>	415
Section 9: Therapy for Non-atonic Bleeding		
51	Conservative Surgical Management <i>C. B-Lynch and H. Shah</i>	433
52	Internal Iliac (Hypogastric) Artery Ligation <i>C. B-Lynch, L. G. Keith and W. B. Campbell</i>	441
53	Initial Interventions to Combat Hemorrhage during Cesarean Section and Internal Iliac Artery Ligation <i>V. P. Paily</i>	448

54	The Pelvic Pressure Pack and the Uterovaginal Balloon System <i>G. A. Dildy III</i>	458
55	Peripartum Hysterectomy <i>T. F. Baskett</i>	462
56	The Management of Secondary Postpartum Hemorrhage <i>K. M. Groom and T. Z. Jacobson</i>	466
57	Use of Fibrin Sealants in Obstetric Hemorrhage <i>S. Mahmoud and E. El Hamamy</i>	474
58	Topical Hemostatic Agents in Obstetric Hemorrhage: International Case Reports <i>C. Wohlmuth and J. Dela Merced</i>	480
Section 10: Consequences of Postpartum Hemorrhage		
59	The Normal and Pathologic Postpartum Uterus <i>P. Kelehan and E. E. Mooney</i>	489
60	Severe Acute Maternal Morbidity and Postpartum Hemorrhage <i>A. Vais and S. Bewley</i>	499
61	Learning to Treat Postpartum Hemorrhage: a Spectrum of Modern Teaching/Learning Modalities <i>E. El Hamamy and C. B-Lynch</i>	514
62	Intensive Care Management after Major Postpartum Hemorrhage <i>R. Hebballi and M. Chauhan</i>	520
63	Litigation: an International Perspective <i>K. J. Dalton</i>	527
Section 11: How Health Professionals Deal with Postpartum Hemorrhage		
64	Management of Postpartum Hemorrhage in Low Resource Settings <i>V. Walvekar, A. Virkud and R. Majumder</i>	539
65	The Obstetrician Confronts Postpartum Hemorrhage <i>M. E. Setchell</i>	545
66	The Midwife Confronts Postpartum Hemorrhage <i>A. M. Ward</i>	549
67	A Community-Based Continuum of Care Model for the Prevention and Treatment of Postpartum Hemorrhage in Low Resource Settings <i>C. T. Kapungu, A. Koch, S. Miller and S. E. Geller</i>	555
68	Human Behavior in Medical Emergencies: Learning from Past Mistakes <i>E. Evans and H. Snelgrove</i>	562
Section 12: Special Circumstances		
69	Out-of-Hospital Deliveries <i>E. Sheiner, I. Ohel and A. Hadar</i>	571
70	Intraoperative Autologous Blood Transfusion <i>S. Catling and D. Thomas</i>	577
71	Treating Hemorrhage from Secondary Abdominal Pregnancy: Then and Now <i>N. A. Dastur, A. E. Dastur and P. D. Tank</i>	583
72	Jehovah's Witnesses and Those Who Refuse Blood Transfusion <i>E. El-Hamamy and D. S. Newman</i>	587
73	MamaNatalie®: a Birthing Simulator for Realistic Training to Control Postpartum Hemorrhage <i>I. Neuman and A. B. Lalonde</i>	602
Appendix: FIGO Guidelines: Prevention and Treatment of Postpartum Hemorrhage in Low-Resource Settings		607
Index		621

The Editors



Sir Sabaratnam Arulkumaran, MD, PhD, FRCS, FRCOG
Professor and Head of Obstetrics and Gynaecology
St George's, University of London, UK



Mahentesh Karoshi, MD, MRCOG, DCRCM
Consultant Obstetrician and Gynaecologist
Department of Obstetrics and Gynaecology
Barnet and Chase Farm Hospitals NHS Trust
Barnet, London, UK



Louis G. Keith, MD, PhD, ScD (Hon), FACOG, FRCOG
Professor Emeritus
Department of Obstetrics and Gynecology
Northwestern University
Former Head, Section of Undergraduate Education and Medical Student Affairs, Chicago, IL, USA



André B. Lalonde, MD, FRCSC, FRCOG
Professor of Obstetrics and Gynaecology
University of Ottawa and McGill University
Ottawa, Canada



Christopher B-Lynch, MBBS, LRCP, FRCS, FRCOG, MAE, D.Univ, MCI Arb QDR
Consultant Obstetrician and Gynaecological Surgeon
Professor (visiting) Cranfield University (Health Faculty);
Consultant Emeritus
Milton Keynes General Hospital NHS Foundation Trust (Oxford Deanery), Milton Keynes, UK

Publishers' Acknowledgments

The Publishers would like to express their sincere thanks to all the Editors and Contributors for their kindness in providing their contributions to this textbook without any remuneration or royalty. It is their generosity that has made this publication possible.

We should also like to express particular thanks to Professor Louis Keith who assumed the primary responsibility for reading and reviewing all the

chapters of the book at the both manuscript and proofing stages; his contribution has been a notable one.

In addition to this printed edition, this book is also available *free* online on the website of *The Global Library of Women's Medicine* (www.glowm.com) – and in this version it also incorporates a number of video clips that serve to illustrate and amplify certain elements of the text.

The Contributors

E. T. Abrams, PhD

Department of Anthropology
University of Illinois at Chicago
Chicago, IL, USA

C. E. M. Aiken, MB/BChir, MA, PhD
Department of Obstetrics and Gynaecology
The Rosie Hospital
Addenbrooke's Hospital
Cambridge, UK

D. Armbruster, CNM, MPH, FACNM
Senior Maternal and Newborn Health Advisor
USAID/GH/HIDN/MCH
Washington, DC, USA

Sir S. Arulkumaran, MD, PhD, FRCS, FRCOG
Professor and Head of Obstetrics and Gynaecology
St George's, University of London, UK

R. K. Atalla, MB, ChB, MRCOG
Consultant Obstetrician and Gynaecologist
Queen Elizabeth II Hospital
Welwyn Garden City, UK

J. Barrett, MD, FRCOG, FRSCS
Division Chief of Maternal Fetal Medicine
Program Research Director, Women and Babies Unit
Sunnybrook Health Science Centre
Aubrey and Marla Dan Program
Toronto, ON;
Chief of Obstetrics and Gynaecology
Director York Central MFM
York Central Hospital
York, ON, Canada

T. F. Baskett, MB, FRCS(C), FRCS (Ed), FRCOG
Professor Emeritus
Department of Obstetrics and Gynaecology
Dalhousie University
Halifax, Nova Scotia, Canada

C. B-Lynch, MBBS, LRCP, FRCS, FRCOG, MAE,
D.Univ, MCI Arb QDR
Consultant Obstetrician and Gynaecological Surgeon
Professor (visiting) Cranfield University (Health Faculty)
Bedfordshire;
Consultant Emeritus
Milton Keynes General Hospital NHS Foundation Trust
(Oxford Deanery)
Milton Keynes, UK

M. B. Bellad, MD, FICOG

Professor
Department of Obstetrics and Gynecology
Jawaharlal Nehru Medical College
Nehru Nagar
Belgaum, Karnataka, India

T. C. Bello-Munoz, MD
Servei de Obstetrícia i Ginecologia
Department of Obstetrics and Gynecology
Hospital Vall de Hebron de Barcelona
Universitat Autònoma de Barcelona
Barcelona, Spain

P. Beretta, MD
Fellow
Yale University School of Medicine
New Haven, CT, USA;
Monastery of San Peter and Paul
Buccinasco, Milan, Italy

S. Bewley, MA, MD, FRCOG
Professor of Complex Obstetrics, KCL
Honorary Clinical Director Obstetrics, NHS London
Division of Women's Health, KHL
Women's Health Academic Centre, Kings Health Partners
St Thomas' Hospital
London, UK

L. Bonsignore, MD
Obstetrician Gynecologist
Desio Hospital
Desio, Milan, Italy

M. Boucher, MD, FRCSC, DABOG(MFM)
Professor of Obstetrics and Gynecology
CHU Sainte-Justine and Faculty of Medicine
Université de Montréal
Montréal, Québec, Canada

F. Breathnach, MD, MRCOG, MRCPI, DCH,
DipGUMed
Consultant Obstetrician Gynaecologist
Senior Lecturer Maternal Fetal Medicine
Royal College of Surgeons in Ireland
Rotunda Hospital
Dublin, Ireland

G. H. Breborowicz, MD, PhD
Director of Perinatology and Gynecology
University of Medical Sciences Poznań
Poznań, Poland

- F. Burbank**, MD, FSIR
Co-Founder and President
The Salt Creek International Women's Health Foundation
San Clemente, CA, USA
- L. Cabero-Roura**, MD, PhD, FRCOG
Servei de Obstetrícia i Ginecologia
Department of Obstetrics and Gynecology
Hospital Vall de Hebron de Barcelona
Universitat Autònoma de Barcelona
Barcelona, Spain
- D. Cabrol**, MD, PhD
Maternité Port-Royal
Hôpital Cochin-Saint-Vincent-de-Paul
Université Paris Descartes
Paris, France
- M. J. Cameron**, MD, MRCOG
Consultant Obstetrician, Subspecialist in Fetal Medicine
Norfolk and Norwich University Hospital
Norwich, Norfolk, UK
- M. Campbell**, MD, MSc
Obstetrics and Gynaecology Resident
Department of Obstetrics and Gynaecology
University of Toronto
Toronto, ON, Canada
- W. B. Campbell**, MS, FRCP, FRCS
Consultant Vascular Surgeon
Royal Devon and Exeter Hospital Peninsula Medical
School
Exeter, UK
- B. Carbonne**, MD
Professor
Department of Obstetrics
Hopital Trousseau
Université Pierre et Marie Curie
Paris, France
- J. C. A. Carvalho**, MD, PhD, FANZCA, FRCPC
Professor of Anesthesia and Obstetrics and Gynecology,
University of Toronto
Director of Obstetric Anesthesia
Mount Sinai Hospital
Toronto, ON, Canada
- S. Catling**, BA(Cantab), FRCA
Department of Anaesthesia and Intensive Care
Morrison and Singleton Hospitals
Abertawe Bro Morgannwg University Health Board
Swansea, Wales, UK
- M. Chauhan**, MBBS, FRCA
Consultant in Anaesthesia
Leicester Royal Infirmary
Leicester, UK
- K. Choji**, FRCR
Consultant in Interventional Radiology
Milton Keynes General Hospital NHS Foundation Trust
(Oxford Deanery)
Milton Keynes, Bucks, UK
- J. G. L. Cockings**, MBBS, FRCA, FANZCA, FCICM,
FFICM
Consultant Intensive Care Physician
Department of Intensive Care Medicine
Royal Berkshire NHS Foundation Trust
Reading, Berkshire, UK
- A. Coker**, MBBS, MRCOG
Consultant Obstetrician and Gynaecologist
Queen's Hospital
Romford, Essex, UK
- D. Cordovani**, MD
Obstetric Anesthesia Fellow
Mount Sinai Hospital
University of Toronto
Toronto, Ontario, Canada
- R. Dabash**, MPH
Director
Gynuity Health Projects
New York, NY, USA
- K. J. Dalton**, LL.M, PhD, FRCOG, FCLM, DFMS
Department of Obstetrics and Gynaecology
University of Cambridge
Cambridge, UK
- D. Danso**, MBBS, MRCOG
Milton Keynes General Hospital NHS Foundation Trust
(Oxford Deanery)
Milton Keynes, Bucks, UK
- A. E. Dastur**, MD, FICOG, FCPS, DGO, DFP,
FICMU, ATMF(USA)
Honorary Professor Emeritus and Dean
Seth G S Medical College
and Nowrosjee Wadia Maternity Hospital
Mumbai, India
- N. A. Dastur**, MD, FICOG, DGO, DFP
Honorary Obstetrician and Gynaecologist
Grant Medical College
Seth G S Medical College
and Nowrosjee Wadia Maternity Hospital
Mumbai, India
- S. De Carolis**, MD
Research Fellow
Department of Obstetrics and Gynecology
Catholic University of the Sacred Heart
Rome, Italy
- J. Dela Merced**, MD
Attending Physician
White Memorial Medical Center
Los Angeles, CA, USA
- R. J. Derman**, MD, MPH, FACOG
Chair, Department of Obstetrics and Gynecology
Christiana Care Health Systems
Director, Center for Women's and Children's Health
Research
Christiana Care Health Systems
Newark, DE;
Professor, Obstetrics and Gynecology
Thomas Jefferson University
Philadelphia, PA, USA
- T. Dey**
Department of Women's and Children's Health
University of Liverpool/Liverpool Women's Hospital
United Kingdom
- G. A. Dildy, III**, MD
Professor of Obstetrics and Gynecology
Director of Obstetrics and Gynecology Quality and Patient
Safety
Vice Chair of Clinical Affairs
Baylor College of Medicine
Houston, TX, USA

A. Duncan, MBBS, BSc, FRCS, FRCSE, FRCOG
Consultant Gynaecological Surgeon
Northampton General Hospital
Northampton, Northamptonshire, UK

I. Dzuba, MHS
Program Associate
Gynuity Health Projects
New York, NY, USA

G. S. Eglinton, MD
Associate Professor, Obstetrics and Gynecology
Weill Medical College of Cornell University
Chairman, Department of Obstetrics and Gynecology
New York Hospital Medical Center of Queens
Flushing, NY, USA

E. El Hamamy, MBChB, MSc, FRCOG, MRCPI
Consultant Obstetrician and Gynaecologist
Nevill Hall Hospital
Abergavenny, Monmouthshire, Wales, UK

H. El-Refaey, MD, MRCOG
Consultant and Honorary Senior Lecturer
Imperial College School of Medicine
Department of Academic Obstetrics and Gynaecology
Chelsea and Westminster Hospital
London, UK

J. B. Elterman, MD
Oregon Health and Science University
Portland, OR, USA

S. Engelbrecht, CNM, MPH, MSN
Consultant for International Medicine
Kenmore, WA, USA

E. Evans, FRCA
Consultant Anaesthetist
St George's Healthcare NHS Trust
London, UK

D. Farine, MD, FRCSC
Professor of Obstetrics and Gynaecology
Head of the Division of Maternal/Fetal Medicine
Mount Sinai Hospital, University of Toronto
Toronto, ON, Canada

M. M. F. Fathalla, MB, ChB(Hons), MD, MRCOG
Associate Professor of Obstetrics and Gynecology
Department of Obstetrics and Gynecology
Faculty of Medicine
Assiut University Women's Health Hospital
Assiut, Egypt

S. Ferrazzani, MD
Associate Professor of Medicine and Prenatal Age
Department of Obstetrics and Gynecology
Catholic University of the Sacred Heart
Ospedale Cristo Re
Rome, Italy

E. Ferrazzi
Professor and Chairman of Obstetrics and Gynecology
University of Milan
V. Buzzi Children Hospital
Milan, Italy

D. Fleming, MD, MRCOG
Consultant
Department of Obstetrics and Gynaecology
Kingston Hospitals NHS Trust
Kingston Upon Thames, UK

R. V. Ganchev, MBChB, MRCP
Associate Specialist in Haematology
Department of Clinical and Laboratory Haematology
Royal Infirmary of Edinburgh
Edinburgh, Scotland, UK

R. Gangopadhyay, MBBS, DFFP, MRCOG
Department of Obstetrics and Gynaecology
Barnet General Hospital
Barnet, London, UK

M. Geary, MD, FRCOG, FRCPI, DCH
Consultant Obstetrician Gynaecologist
Royal College of Surgeons in Ireland
Rotunda Hospital
Dublin, Ireland

S. E. Geller, PhD
G. William Arends Professor of Obstetrics and Gynecology
Director, Center for Research on Women and Gender
Director, National Center of Excellence in Women's
Health
College of Medicine
University of Illinois, Chicago
Chicago, IL, USA

C. Georgiou, BSc, PhD, MBBS, MRCOG,
FRANZCOG
Consultant Obstetrician and Gynaecologist (Wollongong
Hospital)
Associate Professor Obstetrics and Gynaecology
Illawarra Health and Medical Research Institute;
Academic Lead in Obstetrics and Gynaecology
Graduate School of Medicine
University of Wollongong
Wollongong Hospital Academic Unit
Wollongong, NSW, Australia

F. Goffinet, MD, PhD
Maternité Port-Royal
Hôpital Cochin-Saint-Vincent-de-Paul
Université Paris Descartes
Paris, France

S. S. Goudar, MD, MHPE
Professor
Department of Physiology
J. N. Medical College
Belgaum, Karnataka, India

G. Grangé
Maternité Port-Royal
Hôpital Cochin-Saint-Vincent-de-Paul
Université Paris Descartes
Paris, France

D. Green, MD, PhD
Division of Hematology Oncology
Feinberg School of Medicine
Northwestern University
Chicago IL, USA

K. Groom, MBBS, BSc, PhD, FRANZCOG
Senior Lecturer
Department of Obstetrics and Gynaecology
University of Auckland
New Zealand

A. Hadar, MD
Department of Obstetrics and Gynecology
Faculty of Health Sciences
Ben Gurion University of the Negev
Soroka University Medical Center
Be'er-Sheva, Israel

K. Hayes, MRCOG

Consultant in Obstetrics and Gynaecology
St George's Hospital
London, UK

R. Hebballi, MD, FRCA, FCARCSI, FFICM

Consultant in Anaesthesia and Critical Care Medicine
Glenfield Hospital
University Hospitals of Leicester NHS Trust
Leicester, UK

A. Hemmerling, MD, PhD, MPH

Project Director
UCSF Bixby Center for Global Reproductive Health
Department of Obstetrics, Gynecology and Reproductive
Sciences
San Francisco, CA, USA

C. E. Henderson, MPH

Bixby Center for Population, Health and Sustainability
School of Public Health
University of California, Berkeley
Berkeley, CA, USA

P. Hensleigh, MD, PhD (deceased)

Professor Emeritus
Department of Obstetrics and Gynecology
Stanford University
Stanford, CA, USA

T. Ikeda, MD, PhD

Director, Department of Perinatology and Gynecology
National Cerebral and Cardiovascular Center
Osaka, Japan

Y. Imaizumi, Dr of Science

Invited Professor, Department of Health Sciences
Graduate School of Medicine
Osaka University
Osaka, Japan

T. Z. Jacobson, MA, MBBS, FRCOG, FRANZCOG

Staff Specialist
Department of Obstetrics and Gynaecology
Mater Mother's Hospital
Brisbane, Queensland;
Senior Lecturer, University of Queensland, Australia

S. Kapoor, FRCA

Queen's Hospital
Romford, Essex, UK

C. Kapungu, PhD

Assistant Professor in Obstetrics and Gynecology
Center for Research on Women and Gender
University of Illinois at Chicago
Chicago, IL, USA

M. Karoshi, MD, MRCOG, DCRCM

Consultant Obstetrician and Gynaecologist
Department of Obstetrics and Gynaecology
Barnet and Chase Farm Hospitals NHS Trust
Barnet, London, UK

G. Kayem, MD

Service de Gynécologie-Obstétrique
CHI Créteil
Université Paris XII Henri Mondor
Paris, France

L. G. Keith, MD, PhD, ScD (Hon), FACOG, FRCOG

Professor Emeritus
Department of Obstetrics and Gynecology
Northwestern University
Former Head, Section of Undergraduate Education and
Medical Student Affairs
Chicago, IL, USA

P. Kelehan, FRCPath

Consultant Histopathologist (Retired)
Department of Pathology and Laboratory Medicine
National Maternity Hospital
Dublin;
Pathology Assessor, Maternal Death Enquiry
Ireland

A. Kelkar, FRCS

Queen's Hospital
Romford, Essex, UK

R.-U. Khan, BSc, MBBS, MRCOG

Consultant in Obstetrics and Gynaecology
Barts Health NHS Trust;
Honorary Senior Lecturer in Obstetrics and Gynaecology
Queen Mary University of London
London, UK

A. Koch, MA

Center for Research on Women and Gender
University of Illinois at Chicago
Chicago, IL, USA

B. S. Kodkany, MD, DGO, FICS, FICOG

Professor, Department of Obstetrics and Gynaecology
KLE University's Jawaharlal Nehru Medical College
Belgaum, Kanataka;
Director, KLE University's Research Foundation
KLE University
Belgaum, Kanataka, India

J. C. Konje, MD, FMCOG(Nig), FRCOG

Professor, Reproductive Sciences Section
Department of Cancer Studies and Molecular Medicine
University of Leicester
Leicester Royal Infirmary
Leicester, UK

A. B. Lalonde, MD, FRCSC, FRCOG

Professor of Obstetrics and Gynaecology
University of Ottawa and McGill University
Ottawa, Canada

F. Lester, MD, MS, MPH

Health Sciences Clinical Instructor
Department of Obstetrics, Gynecology and Reproductive
Sciences
Division of Gynecology, Global Women's Health
University of California, San Francisco, USA

J. Liljestrand, MD, PhD

Associate Professor
University Research Co
Cambodia

E. S. Linn, MD

Cook County Health and Hospital Systems Chair
Department of Obstetrics and Gynecology
John H. Stroger Jr Hospital of Cook County;
Associate Professor
Department of Obstetrics and Gynecology
Feinberg School of Medicine Northwestern University
Chicago, IL, USA

- E. Lockhart, MD**
Associate Medical Director
Duke University Medical Center Transfusion Service
Assistant Professor of Pathology
Duke University Medical Center
Durham, NC, USA
- I. P. Lowenwirt, MD**
Clinical Assistant Professor of Anesthesiology
Weill Medical College of Cornell University
Associate Chairman and Director of Obstetric
Anesthesiology
New York Hospital Medical Center of Queens
Flushing, NY, USA
- C. A. Ludlam, PhD, FRCP, FRCPath**
Professor of Haematology and Coagulation Medicine
Director of Haemophilia and Thrombosis Centre
Royal Infirmary of Edinburgh
Edinburgh, Scotland, UK
- S. Mahmoud, MBChB, MSc**
Specialist Registrar
Royal Gwent Hospital
Newport, Wales, UK
- R. Majumder, MBBS, MS**
Senior Registrar
Bhatia Hospital
Mumbai, India
- R. Malapati, MD**
Associate Residency Program Director Medical
Co-Director of Obstetrics
Department of Obstetrics and Gynecology
John H Stroger Jr Hospital of Cook County;
Assistant Professor
Feinberg School of Medicine
Northwestern University
Chicago, IL, USA
- M. K. Mehasseb, MD, PhD, MRCOG**
Department of Obstetrics and Gynaecology
The Rosie Hospital
Addenbrooke's Hospital
Cambridge, UK
- S. Miller, CNM, PhD**
Associate Professor
Director, Safe Motherhood Programs
Department of Obstetrics, Gynecology and Reproductive
Sciences
Bixby Center for Global Reproductive Health and Policy
Center of Expertise, Women's Health and Empowerment
Global Health Institute
University of California, San Francisco (UCSF)
San Francisco, CA, USA
- E. E. Mooney, FRCPath**
Consultant Histopathologist
Department of Pathology and Laboratory Medicine
National Maternity Hospital
Dublin, Ireland
- J. L. Morris, MA**
Project Specialist, Safe Motherhood Programs
University of California, San Francisco
San Francisco, CA, USA
- M. Mourad-Youssif, MD, MRCOG**
Consultant Obstetrician and Gynecologist
El-Galaa Maternity Teaching Hospital
Cairo, Egypt
- M. W. Musaba**
Department of Obstetrics and Gynaecology
Busitema University/Mbale Regional Referral and
Teaching Hospital
Mbale, Uganda
- I. Neuman, MPH**
Senior Program Development and Implementation
Manager
Laerdal Global Health AS
Tanke Svilands
Stavanger, Norway
- D. S. Newman, ACP, FCollP, FRGS, ALPI**
Chairman
South and West Wales Hospital Liaison Committee for
Jehovah's Witnesses
Cardiff, UK
- M. P. O'Connell, MD, FRCOG, FRCPI, MSc, DCH**
Coombe Women and Infants University Hospital
Dublin, Ireland
- I. Ohel, MD**
Department of Obstetrics and Gynecology
Faculty of Health Sciences
Ben Gurion University of the Negev
Soroka University Medical Center
Beer-Sheva, Israel
- O. Ojengbede, BSc(Hons), FMCOG, FWACS, FICS**
Professor and Director
Centre for Population and Reproductive Health
College of Medicine
University College Hospital
Ibadan, Nigeria
- P. Okong, MMed, PhD**
Department of Obstetrics and Gynecology
St Francis Hospital Nsambya
Uganda
- R. Oliver, MBBS, MRCOG**
Queen's Hospital
Romford, Essex, UK
- O. Onwuemene, MD**
Division of Hematology Oncology
Feinberg School of Medicine
Northwestern University
Chicago, IL, USA
- C. Otigbah, MRCOG**
Queen's Hospital
Romford, Essex, UK
- M. J. Paidas, MD, FACOG**
Professor
Co-Director, Yale Women and Children's Center for
Blood Disorders
Co-Director, National Hemophilia Foundation- Baxter
Clinical Fellowship Program at Yale
Division of Maternal Fetal Medicine
Department of Obstetrics, Gynecology and Reproductive
Sciences
Yale University School of Medicine
New Haven, CT, USA
- V. P. Paily, MD, MRCOG, FRCOG**
Consultant
Mother Hospital and Raji Nursing Home
Thrissur, Kerala, India

J. M. Palacios-Jaraquemada, MD, PhD

Professor, School of Medicine
University of Buenos Aires
Buenos Aires, Argentina

A. Pankhania, MRCS, FRCR

Queen's Hospital
Romford, Essex, UK

A. Patel, MD, MPH

System Director of Family Planning Services
Division of Family Planning
Department of Obstetrics and Gynecology
John H. Stroger Jr Hospital of Cook County;
Associate Professor
Feinberg School of Medicine, Northwestern University;
Senior Medical Director of Research
Planned Parenthood Federation of America
Chicago, IL, USA

S. Paterson-Brown, FRCS, FRCOG

Consultant Obstetrician and Gynaecologist
Queen Charlotte's Hospital
London, UK

P. Patrizio, MD, MBE

Professor, Department of Obstetrics, Gynecology and
Reproductive Sciences
Director, Yale Fertility Center
Clinical Practice Director, Yale Fertility Center
Yale University School of Medicine
New Haven, CT, USA

A. Perrelli, MD

Consultant
Department of Obstetrics and Gynecology
Catholic University of the Sacred Heart
Rome, Italy

C. Piscicelli, MD

Medical Assistant
Department of Obstetrics and Gynecology
Ospedale Cristo Re
Rome, Italy

M. Potts, MB, BChir, PhD, FRCOG

Bixby Center for Population, Health and Sustainability
School of Public Health
University of California, Berkeley
Berkeley, CA, USA

N. Prata, MD, MSc

Associate Professor in Residence
Scientific Director, Bixby Center for Population Health
and Sustainability
School of Public Health, University of California, Berkeley
Berkeley, CA, USA

S. Ricci, PhD

Researcher
Department of Electronics and Telecommunications
University of Florence
Florence, Italy

G. M. Riha, MD

Department of Surgery
Oregon Health and Science University
Portland, OR, USA

P. W. Reginald, MD (London), FRCOG

Heatherwood and Wexham Park NHS Trust
Slough, Berkshire, UK

A. B. Roston, BA

Division on Family Planning
Department of Department of Obstetrics and Gynecology
John H. Stroger, Jr Hospital of Cook County
Chicago, IL, USA

A. L. Roston, MPH

Division on Family Planning
Department of Department of Obstetrics and Gynecology
John H. Stroger, Jr Hospital of Cook County
Chicago, IL, USA

R. Rushwan, MD, FRCOG, FACOG

Chief Executive
International Federation of Gynecology and Obstetrics
London, UK

J. N. Rutherford, PhD

University of Illinois at Chicago
Departments of Oral Biology and Anthropology
Chicago, IL, USA

T. Schmitz, MD

Maternité Port-Royal
Hôpital Cochin-Saint-Vincent-de-Paul
Université Paris Descartes
Paris, France

M. A. Schreiber, MD

Department of Surgery
Oregon Health and Science University
Portland, OR, USA

L. Sentilhes, MD, PhD

Service de Gynécologie-Obstétrique
Centre Hospitalier Universitaire d'Angers
France

M. E. Setchell, CVO, MA, MB, BChir (Cantab),
FRCS(Eng), FRCOG

Surgeon-Gynaecologist to HM The Queen
Hon. Consultant Obstetrician and Gynaecologist
St Bartholomew's, Homerton, and Whittington Hospitals
London, UK

H. D. Shah, MBBS (Hons), MA (Cantab)

Department of Obstetrics and Gynaecology
Newham University Hospital
Barts Health NHS Trust
London, UK

E. Sheiner, MD, PhD

Department of Obstetrics and Gynecology
Faculty of Health Sciences
Ben Gurion University of the Negev
Soroka University Medical Center
Beer-Sheva, Israel

T. Shimizu

Department of Radiology
Hokkaido University Hospital
Sapporo, Japan

D. W. Skupski, MD

Professor, Obstetrics and Gynecology
Weill Medical College of Cornell University
Associate Chairman and Director of Maternal Fetal
Medicine
Department of Obstetrics and Gynecology
New York Hospital Medical Center of Queens
Flushing, NY, USA

- N. L. Sloan**, DrPH
Senior Clinical Researcher
Center for Women's and Children's Health Research
Christiana Care Health Systems
Newark, DE;
Assistant Professor
Department of Population and Family Health
Mailman School of Public Health, Columbia University
New York, NY, USA
- H. Snelgrove**, MA, MedED, BA(Hon), Dip Ed
St George's Healthcare NHS Trust
Education and Development Department
London, UK
- S. Sobieszczyk**, MD, PhD
Internal Medicine Consultant
Consultant in Anesthesiology and Intensive Care
Laboratory Director Cardiovascular and Hemostatic Disorders
Department of Perinatology and Gynecology
University of School of Medicine
Poznań, Poland
- A. L. Stenson**, MD, MPH
David Geffen School of Medicine
Department of Obstetrics and Gynecology
Center for the Health Sciences
Los Angeles, CA, USA
- P. D. Tank**, MD, DNBE, FCPS, DGO, DFP, MNAMS, MRCOG
Honorary Clinical Associate
Seth G S Medical College;
Nowrosjee Wadia Maternity Hospital
Mumbai, India
- D. Thomas**, MBChB, FRCA
Department of Anaesthesia and Intensive Care Medicine
Morrison and Singleton Hospitals
Abertawe Bro Morgannwg University Health Board
Swansea, Wales, UK
- M. O. Thompson**, MRCOG, FWACS
Queen's Hospital
Romford, Essex, UK
- M. K. Tipples**, MRCOG, FRCSEd
Western Sussex Hospital Trust
Chichester, West Sussex, UK
- P. Tortoli**, PhD
Professor
Department of Electronics and Telecommunications
University of Florence
Florence, Italy
- V. Tsatsaris**, MD, PhD
Maternité Port-Royal
Hôpital Cochin-Saint-Vincent-de-Paul
Université Paris Descartes
Paris, France
- J. Unterscheider**, MRCPI, MRCOG
Specialist Registrar in Obstetrics and Gynaecology
Royal College of Surgeons in Ireland
Rotunda Hospital
Dublin, Ireland
- G. Urban**, MD, PhD
Post-Doctoral Fellow
Yale University School of Medicine
New Haven, CT, USA;
Desio Hospital
Desio, Milan, Italy
- A. Vais**, MRCOG
Clinical Fellow in Maternal Medicine
St Thomas' Hospital
London, UK
- H. Valensise**
Associate Professor
University of Rome Tor Vergata
Rome, Italy
- P. Vergani**, MD
Associate Professor
Department of Obstetrics and Gynecology
University of Milan-Bicocca
San Gerardo Hospital
Monza, Italy
- A. Virkud**, MD, DGO, FCPS, FICOG
37B Shalan Building
Mumbai, India
- C. von Widekind**, MD, MRCOG
Consultant Obstetrician and Gynaecologist
Northampton General Hospital
Northampton, Northants, UK
- C. S. Waldmann**, MA, MB, BChir, FRCA, FFICM, EDIC
Consultant Intensive Care Physician
Department of Intensive Care Medicine
Royal Berkshire NHS Foundation Trust
Reading, Berkshire, UK
- V. Walvekar**, MD, DGO, FCPS, FICOG
62 Suraiya Apartments
Worli
Mumbai, India
- J. N. Wandabwa**
Department of Obstetrics and Gynaecology
Busitema University/Mbale Regional Referral and Teaching Hospital
Mbale, Uganda
- A. Ward**, RM, RN
Head of Midwifery
Supervisor of Midwives
Mid Yorkshire NHS Trust
Pinderfields Hospital
Wakefield, UK
- A. D. Weeks**
Department of Women's and Children's Health
University of Liverpool/Liverpool Women's Hospital
United Kingdom
- B. Winikoff**, MD, MPH
President
Gynuity Health Projects
New York, NY, USA
- C. Wohlmuth**, MD
Residency Program Director
Department of Obstetrics and Gynecology
White Memorial Medical Center
Los Angeles, CA, USA

FOREWORD: a FIGO Perspective

The second edition of *A Comprehensive Textbook of Postpartum Hemorrhage* will be launched during the International Federation of Gynecology and Obstetrics (FIGO) World Congress in Rome, Italy in October 2012. For FIGO, this marks another important step in the battle to improve maternal health and to decrease maternal mortality.

The international efforts spearheaded by FIGO and UN agencies to reduce maternal mortality have shown positive results in recent years. Studies in 2010, 2011 and 2012 have reported important decreases in maternal mortality worldwide. However, as these estimates are based on mathematical models and many countries still have poor programs related to vital statistics, these reductions must be appraised cautiously.

In spite of the uncertainty regarding exact numbers, no controversy exists about the need for prevention and treatment of postpartum hemorrhage (PPH). Although recent evidence suggests there is a decline in maternal mortality worldwide, a simultaneous increase in the proportion of maternal deaths due to PPH in Latin America, Africa and South East Asia has been noted. Whereas many countries have made progress, others have stagnated, and a few actually show an increase in maternal mortality. In some countries, maternal mortality is the cause of over 50% of maternal deaths, with Guatemala and Afghanistan serving as prime examples.

The original chapters in this book continue to address issues of vital statistic definitions, accurate measurements of blood loss, hospital management and use of new medications to stem the tremendous burden of PPH. In the revised and new chapters, discussion on the increase in incidence of PPH and maternal mortality due to placenta previa and placenta accreta, most probably due to the higher numbers of cesarean sections in the past 5–10 years worldwide is presented.

The balloon internal uterine tamponade, both as a diagnostic test and as a treatment, is expanded in a number of chapters. Because it would be difficult if not unethical to conduct a randomized control trial on tamponade use or many other therapies for PPH,

clinical practice and a registry would go a long way towards establishing this as a true advance in the treatment of severe PPH.

The update on the Prevention of PPH Initiative (POPPHI) project has shown the positive impact of active management of the third stage of labor, so much so that both FIGO and WHO now recommend this as a routine for all women birthing throughout the world. Further presentations are provided on the use of misoprostol for either prevention or treatment in the absence of other available uterotonic medications. Coagulation disorders are discussed, as well as the use of recombinant factor VIIa and the use of carbetocin for the prevention of PPH at cesarean section.

Many chapters discuss the importance of timing in the diagnosis and early treatment of PPH from the community to the referral level. Examples include discussion on misoprostol use by traditional birth attendants under supervision of a trained birth attendant and the non-pneumatic anti-shock garment (NASG). This technique appears to be lifesaving and it continues to be utilized and clinically evaluated throughout the world where women are suffering massive PPH, are in shock and where immediate treatment is not available.

In several chapters the relatively recent recognition that the ratio of fibrinogen : red blood cells : plasma and the timing of their administration has an important effect on enhancing survival is discussed. This information, obtained from military and trauma surgical registers, will be new to many readers, as will the need to use protocols when massive blood transfusion is being administered.

FIGO began its PPH prevention and treatment campaign in 2003. We have made significant progress, but are still faced with serious challenges in order for health care professionals to be trained under one system with available medications at all times and with a system of referral from the community to the first referral hospital. It is not only important to have training programs in place, but also the implementation of training is now the challenge facing health care professionals and birth attendants throughout the

world. Countries which have been successful are those countries with a system in place that ensures that medication is available at all times in all birthing units.

PPH continues to threaten women's lives in low and high resource countries and is the most important cause of maternal mortality in low resource countries. The majority of cases of PPH are due to uterine atony where the treatment is well known but needs to be institutionalized all over the world. It is not well understood that in high-risk situations we can reduce risk significantly by having a continuous training evaluation of near misses and maternal deaths and by using simple low-cost technology such as tamponade or the NASG garment.

FIGO and International Confederation of Midwives (ICM) have supported the training and implementation of active management of the third stage of labor. Now is the time for all countries to embrace the FIGO and WHO guidelines on PPH and make these

guidelines available in all of the birthing units in our respective countries. We have proposed wall charts for all birthing units in the PPH guideline chapter. Until we systematically address this issue, PPH will continue to be a death threat to many women in the world.

In closing, we would like to thank Mr David Bloomer and his wife Paula who, as publishers of this volume and *The Global Library of Women's Medicine* (GLOWM), provide unconditional support to make this book available throughout the world in many languages.

Gamal Serour, MD, MCROG, FRCS, FRCOG
President, International Federation of Gynecology and Obstetrics (FIGO)
(2009–2012)

André B. Lalonde, MD, FRCSC, FRCOG
Chair, FIGO Safe Motherhood and Newborn Health Committee, 2006–2012

Editors' Preface

The first edition of *A Textbook of Postpartum Hemorrhage* was launched with fanfare on October 11, 2006 by HRH the Princess Royal at Chandos House, The Royal Society of Medicine, London. The four editors and Mr David Bloomer, the book's publisher who, along with his wife Paula supported its publication, could not have anticipated its enthusiastic reception by the medical profession throughout the world. In all, more than 15,000 copies of this volume were distributed free of charge to doctors practicing obstetrics and gynecology in the most diverse locations and under the most varied circumstances. In addition, the book was widely accessed, and individual chapters downloaded, via the website of *The Global Library of Women's Medicine* (www.glowm.com). Of equal importance, when the editors embarked on a series of postgraduate courses in the UK, Egypt, Ukraine, India, Malaysia and China, among others, practitioners invariably voiced their thankfulness for having the book in their hands, noting over and over how their use of it has saved a patient's life.

Of course, it had been our hope and fervent desire that the efforts that we made to prepare the first edition would do just that, i.e. save women's lives and reduce the scandalous loss of maternal life due to postpartum hemorrhage (PPH). In this regard, we were more than compensated for our efforts, but it soon became obvious that a second edition was necessary. Many things had changed since 2005 when we began planning the first edition, not least of which was an important re-evaluation of the most useful methodology to provide massive transfusion and a far clearer understanding of the uterine anatomy as it pertains to the blood vessels of that organ. This latter subject was under-represented in the first edition, and the former was unknown at the time of its writing.

As was the case in the first edition, the complete book is universally available entirely free on the website of *The Global Library of Women's Medicine*. Once again, neither authors nor editors have received compensation for their time and contribution. Many of the original chapters have been revised and updated,

whilst new chapters cover a range of additional topics including the uterine anatomy, the recent changes in transfusion practices, difficulties presented by adherent placentas, intrauterine balloon therapy and the active management of the third stage of labor. Where appropriate, links to video clips are provided.

The editors wish to thank Professor Sir Subaratnam Arulkumaran for joining the editorial team in the position of Senior Editor and for his many insights into the global perspectives of PPH at a time when he is about to become President Elect of FIGO. They also wish to thank Professor Louis Keith for his careful editorial expertise in reviewing each chapter at both the manuscript and the page proof stages. Thanks also are extended to Dorothy Walmsley who served as desk editor for the publication and to Julia Tissington who acted as project manager. Finally, but by no means last in terms of the importance of their contributions, immense gratitude is due to Paula and David Bloomer, founders of *The Global Library of Women's Medicine* (and also of Sapiens Publishing). As was the case with the first edition, this book is produced in grateful and loving memory of their daughter, Abigail Bloomer, who sadly died at the early age of 31 from that other scourge of women, breast cancer, in December 2001.

Sir Sabaratnam Arulkumaran, MD, PhD, FRCS, FRCOG

St George's, University of London, UK

Mahantesh Karoshi, MD, MRCOG, DCRCM

Barnet and Chase Farm Hospitals NHS Trust, Barnet, London, UK

Louis G. Keith, MD, PhD, FACOG, FRCOG

Northwestern University, Chicago, USA

André B. Lalonde, MD, FRCSC, FRCOG

University of Ottawa and McGill University, Ottawa, Canada

Christopher B-Lynch, FRCS, FRCOG, D Univ

Milton Keynes General Hospital NHS Foundation Trust (Oxford Deanery), UK