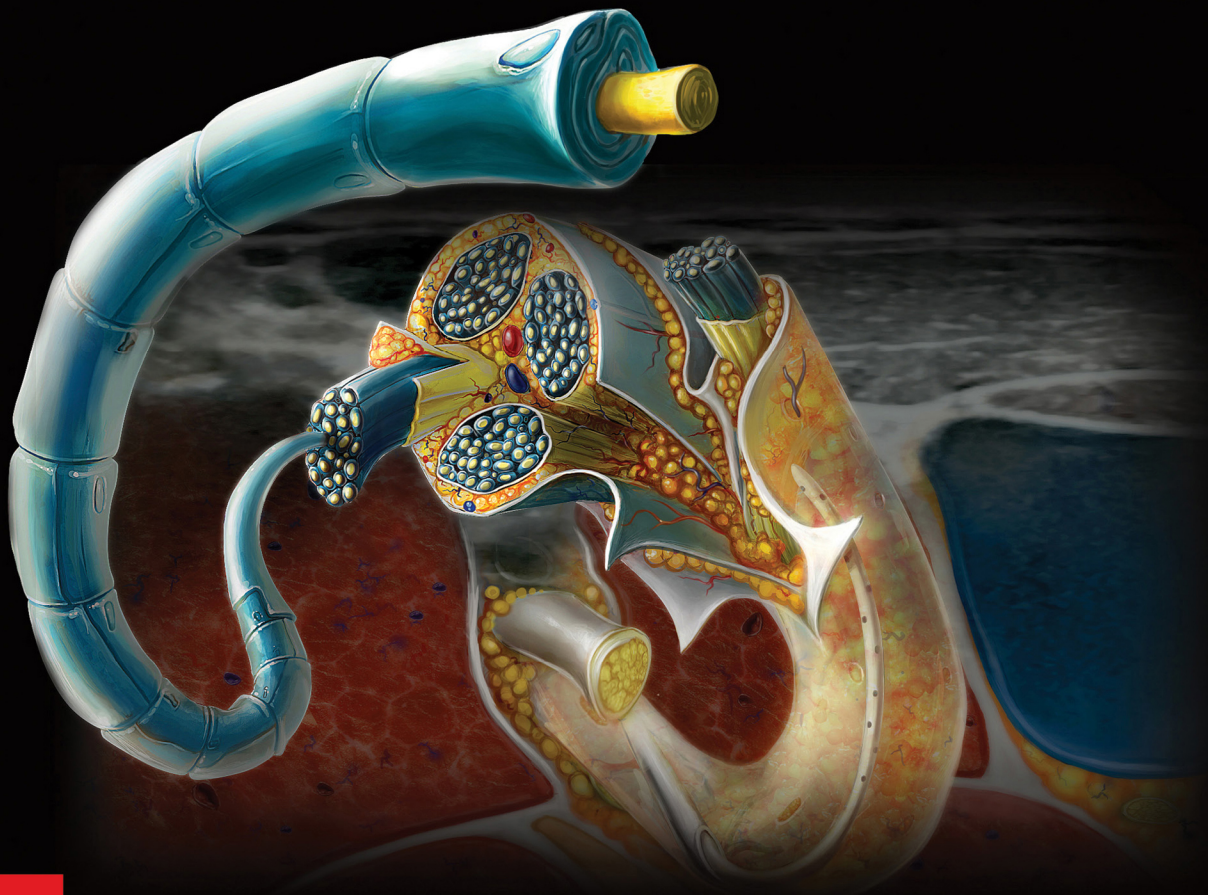


THE NEW YORK SCHOOL OF REGIONAL ANESTHESIA

Hadzic's TEXTBOOK OF Regional Anesthesia

AND ACUTE PAIN MANAGEMENT

SELF-ASSESSMENT AND REVIEW



Mc
Graw
Hill
Education

Admir Hadzic

Hadzic's Textbook of Regional Anesthesia and Acute Pain Management

Self-Assessment and Review

NOTICE

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required. The authors and the publisher of this work have checked with sources believed to be reliable in their efforts to provide information that is complete and generally in accord with the standards accepted at the time of publication. However, in view of the possibility of human error or changes in medical sciences, neither the authors nor the publisher nor any other party who has been involved in the preparation or publication of this work warrants that the information contained herein is in every respect accurate or complete, and they disclaim all responsibility for any errors or omissions or for the results obtained from use of the information contained in this work. Readers are encouraged to confirm the information contained herein with other sources. For example and in particular, readers are advised to check the product information sheet included in the package of each drug they plan to administer to be certain that the information contained in this work is accurate and that changes have not been made in the recommended dose or in the contraindications for administration. This recommendation is of particular importance in connection with new or infrequently used drugs.

Hadzic's Textbook of Regional Anesthesia and Acute Pain Management

Self-Assessment and Review

Editor

Admir Hadzic, MD, PhD

Professor of Anesthesiology

Consultant, Anesthesiology, Intensive Care, Emergency Medicine and Pain Therapy

Ziekenhuis Oost-Limburg

Genk, Belgium

Director, NYSORA, The New York School of Regional Anesthesia

New York, New York

Assistant Editor

Angela Lucia Balocco, MD

Anesthesiologist

Research Fellow

NYSORA, The New York School of Regional Anesthesia

New York, New York



New York Chicago San Francisco Athens London Madrid Mexico City
Milan New Delhi Singapore Sydney Toronto

Copyright © 2019 by McGraw-Hill Education. All rights reserved. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

ISBN: 978-1-26-014271-6

MHID: 1-26-014271-X

The material in this eBook also appears in the print version of this title: ISBN: 978-1-26-014270-9, MHID: 1-26-014270-1.

eBook conversion by codeMantra
Version 1.0

All trademarks are trademarks of their respective owners. Rather than put a trademark symbol after every occurrence of a trademarked name, we use names in an editorial fashion only, and to the benefit of the trademark owner, with no intention of infringement of the trademark. Where such designations appear in this book, they have been printed with initial caps.

McGraw-Hill Education eBooks are available at special quantity discounts to use as premiums and sales promotions or for use in corporate training programs. To contact a representative, please visit the Contact Us page at www.mhprofessional.com.

TERMS OF USE

This is a copyrighted work and McGraw-Hill Education and its licensors reserve all rights in and to the work. Use of this work is subject to these terms. Except as permitted under the Copyright Act of 1976 and the right to store and retrieve one copy of the work, you may not decompile, disassemble, reverse engineer, reproduce, modify, create derivative works based upon, transmit, distribute, disseminate, sell, publish or sublicense the work or any part of it without McGraw-Hill Education's prior consent. You may use the work for your own noncommercial and personal use; any other use of the work is strictly prohibited. Your right to use the work may be terminated if you fail to comply with these terms.

THE WORK IS PROVIDED "AS IS." MCGRAW-HILL EDUCATION AND ITS LICENSORS MAKE NO GUARANTEES OR WARRANTIES AS TO THE ACCURACY, ADEQUACY OR COMPLETENESS OF OR RESULTS TO BE OBTAINED FROM USING THE WORK, INCLUDING ANY INFORMATION THAT CAN BE ACCESSED THROUGH THE WORK VIA HYPERLINK OR OTHERWISE, AND EXPRESSLY DISCLAIM ANY WARRANTY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. McGraw-Hill Education and its licensors do not warrant or guarantee that the functions contained in the work will meet your requirements or that its operation will be uninterrupted or error free. Neither McGraw-Hill Education nor its licensors shall be liable to you or anyone else for any inaccuracy, error or omission, regardless of cause, in the work or for any damages resulting therefrom. McGraw-Hill Education has no responsibility for the content of any information accessed through the work. Under no circumstances shall McGraw-Hill Education and/or its licensors be liable for any indirect, incidental, special, punitive, consequential or similar damages that result from the use of or inability to use the work, even if any of them has been advised of the possibility of such damages. This limitation of liability shall apply to any claim or cause whatsoever whether such claim or cause arises in contract, tort or otherwise.

This book is dedicated to all students of anesthesiology and regional anesthesia and acute pain medicine.

This page intentionally left blank

Contents

Contributors.....	xi
Preface.....	xvii
Acknowledgments	xix

PART 1 History 1

1 The History of Local Anesthesia	3
-----------------------------------------	---

PART 2 Foundations of Local and Regional Anesthesia 5

SECTION 1 ANATOMY AND HISTOLOGY OF PERIPHERAL NERVOUS SYSTEM AND NEURAXIS 5

2 Functional Regional Anesthesia Anatomy	7
3 Histology of the Peripheral Nerves and Light Microscopy	11
4 Connective Tissues of Peripheral Nerves	15
5 Ultrastructural Anatomy of the Spinal Meninges and Related Structures.....	17

SECTION 2 PHARMACOLOGY 21

6 Clinical Pharmacology of Local Anesthetics	23
7 Controlled-Release Local Anesthetics	27
8 Analgesic Adjuvants in the Peripheral Nervous System.....	31
9 Local Anesthetic Mixtures for Peripheral Nerve Blocks.....	35
10 Continuous Peripheral Nerve Blocks: Local Anesthetic Solutions and Infusion Strategies.....	37

SECTION 3 EQUIPMENT FOR PERIPHERAL NERVE BLOCKS 41

11 Equipment for Regional Anesthesia	43
12 Equipment for Continuous Peripheral Nerve Blocks	49
13 Electrical Nerve Stimulators and Localization of Peripheral Nerves	53

SECTION 4 PATIENT MANAGEMENT CONSIDERATIONS 57

14 Developing Regional Anesthesia Pathways	59
15 Infection Control in Regional Anesthesia	63

16 Local Anesthetics, Regional Anesthesia, and Cancer Recurrence	65
17 Perioperative Regional Anesthesia and Analgesia: Effects on Cancer Recurrence and Survival After Oncological Surgery	71

PART 3 Clinical Practice of Regional Anesthesia 75

PART 3A Local and Infiltrational Anesthesia 75

18 Intra-articular and Periarticular Infiltration of Local Anesthetics	77
19 Regional and Topical Anesthesia for Awake Endotracheal Intubation	81

PART 3B Intravenous Regional Block for Upper and Lower Extremity 85

20 Intravenous Regional Block for Upper and Lower Extremity Surgery	87
---------------------------------------------------------------------------	----

PART 3C Neuraxial Anesthesia 91

SECTION 1 SPINAL ANESTHESIA 91

21 Neuraxial Anatomy (Anatomy Relevant to Neuraxial Anesthesia)	93
22 Spinal Anesthesia	99
22A Mechanisms and Management of Failed Spinal Anesthesia	103

SECTION 2 EPIDURAL ANESTHESIA 107

23 Epidural Anesthesia and Analgesia	109
--------------------------------------------	-----

SECTION 3 CAUDAL ANESTHESIA 121

24 Caudal Anesthesia	123
----------------------------	-----

SECTION 4 COMBINED SPINAL AND EPIDURAL ANESTHESIA 127

25 Combined Spinal-Epidural Anesthesia	129
----------------------------------------------	-----

SECTION 5 POSTDURAL PUNCTURE HEADACHE 135

26	Postdural Puncture Headache	137
----	-----------------------------------	-----

PART 3D Ultrasound-Guided Nerve Blocks 141**SECTION 1 FUNDAMENTALS OF ULTRASOUND-GUIDED REGIONAL ANESTHESIA 141**

27	Physics of Ultrasound	143
28	Optimizing an Ultrasound Image	147
29	Introduction to Ultrasound-Guided Regional Anesthesia	151

SECTION 2 ULTRASOUND-GUIDED HEAD AND NECK NERVE BLOCKS 155

30	Nerve Blocks of the Face	157
----	--------------------------------	-----

SECTION 3 ULTRASOUND-GUIDED NERVE BLOCKS FOR THE UPPER EXTREMITY 161

31A	Ultrasound-Guided Cervical Plexus Block	163
31B	Ultrasound-Guided Interscalene Brachial Plexus Block	167
31C	Ultrasound-Guided Supraclavicular Brachial Plexus Block	169
31D	Ultrasound-Guided Infraclavicular Brachial Plexus Block	173
31E	Ultrasound-Guided Axillary Brachial Plexus Block	177
31F	Ultrasound-Guided Blocks at the Elbow	181
31G	Ultrasound-Guided Wrist Block	185

SECTION 4 ULTRASOUND-GUIDED NERVE BLOCKS FOR THE LOWER EXTREMITY 187

32A	Ultrasound-Guided Femoral Nerve Block	189
32B	Ultrasound-Guided Fascia Iliaca Block	195
32C	Ultrasound-Guided Lateral Femoral Cutaneous Nerve Block	201
32D	Ultrasound-Guided Obturator Nerve Block	203
32E	Ultrasound-Guided Saphenous (Subsartorius/Adductor Canal) Nerve Block	205
32F	Ultrasound-Guided Sciatic Nerve Block	207
32G	Ultrasound-Guided Popliteal Sciatic Block	213
32H	Ultrasound-Guided Ankle Block	215

SECTION 5 ULTRASOUND-GUIDED NERVE BLOCKS FOR ABDOMINAL AND THORACIC WALL 217

33	Ultrasound-Guided Transversus Abdominis Plane and Quadratus Lumborum Blocks	219
34	Pectoralis and Serratus Plane Blocks	225

PART 3E Local and Regional Anesthesia for Oral and Maxillofacial Surgery 231

35	Oral and Maxillofacial Regional Anesthesia	233
----	--------------------------------------------------	-----

PART 3F Local and Regional Anesthesia for the Eye 237

36	Local and Regional Anesthesia for Ophthalmic Surgery	239
----	------------------------------------------------------------	-----

PART 4 Ultrasound Imaging of Neuraxial and Perivertebral Space 243

37	Sonography of the Lumbar Paravertebral Space and Considerations for Ultrasound-Guided Lumbar Plexus Block	245
38	Lumbar Paravertebral Sonography and Considerations for Ultrasound-Guided Lumbar Plexus Block	249
39	Spinal Sonography and Applications of Ultrasound for Central Neuraxial Blocks	255

PART 5 Obstetric Anesthesia 261

40	Obstetric Regional Anesthesia	263
----	-------------------------------------	-----

PART 6 Pediatric Anesthesia 271

41	Regional Anesthesia in Pediatric Patients: General Considerations	273
42	Pediatric Epidural and Spinal Anesthesia and Analgesia	277
43	Peripheral Nerve Blocks for Children	283
44	Acute and Chronic Pain Management in Children	285

PART 7 Anesthesia in Patients with Specific Considerations 287

45	Perioperative Regional Anesthesia in the Elderly	289
46	Regional Anesthesia and Cardiovascular Disease	295
47	Regional Anesthesia and Systemic Disease	299
48	Regional Anesthesia in the Patient with Preexisting Neurologic Disease	303
49	Acute Compartment Syndrome of the Limb: Implications for Regional Anesthesia	307
50	Peripheral Nerve Blocks for Outpatient Surgery	309
51	Neuraxial Anesthesia and Peripheral Nerve Blocks in Patients on Anticoagulants	313
52	Regional Analgesia in the Critically Ill	317
53	Acute Pain Management in the Opioid-Dependent Patient	319
54	Regional Anesthesia in Patients with Trauma	325

55	Regional Anesthesia for Cardiac and Thoracic Anesthesia	329	66	Regional Anesthesia and Perioperative Outcome	381
56	Regional Anesthesia in Austere Environment Medicine	333	67	The Effects of Regional Anesthesia on Functional Outcome After Surgery	383
57	Anesthesia for Humanitarian Relief Operations	337			
PART 8 Regional Anesthesia in the Emergency Department		341	PART 12 Acute Pain Management 385		
58	Regional Anesthesia and Acute Pain Management in the Emergency Department	343	68	Intravenous Patient-Controlled Analgesia	387
PART 9 Complications of Local and Regional Anesthesia		347	69	Continuous Peripheral Nerve Blocks	389
59	Complications and Prevention of Neurologic Injury with Peripheral Nerve Blocks	349	70	Organization of an Acute Pain Management Service Incorporating Regional Anesthesia Techniques	391
60	Assessment of Neurologic Complications of Regional Anesthesia	355	71	Multimodal Analgesia: Pharmacologic Interventions and Prevention of Persistent Postoperative Pain	393
61	Perioperative Nerve Injury Unrelated to Nerve Blockade	359	72	The Role of Nonopioid Analgesic Infusions in the Management of Postoperative Pain	397
62	Monitoring, Documentation, and Consent for Regional Anesthesia Procedures	363	PART 13 Education in Regional Anesthesia 401		
63	Diagnosis and Management of Spinal and Peripheral Nerve Hematoma	367	73	Teaching Regional Anesthesia	403
PART 10 LAST: Local Anesthetic Systemic Toxicity		371	PART 14 Statistics and Principles of Research Design in Regional Anesthesia and Acute Pain Medicine 407		
64	Local Anesthetic Systemic Toxicity	373	74	Principles of Statistical Methods for Research in Regional Anesthesia	409
PART 11 Perioperative Outcome and Economics of Regional Anesthesia		377	Index		
65	Regional Anesthesia, Cost, Operating Room, and Personnel Management	379			

This page intentionally left blank

Contributors

Sherif Abbas, MD

Anesthesiologist
UZ Leuven, Catholic University of Leuven
Leuven, Vlaams-Brabant, Belgium

Michael Akerman, MD

Assistant Professor of Anesthesiology
Regional Anesthesia and Acute Pain Medicine
Weill Cornell Hospital
New York, New York

Arthur Atchabahian, MD, FASA

Professor of Clinical Anesthesiology
Director, Regional Anesthesia Fellowship
NYU School of Medicine
New York, New York

Angela Lucia Balocco, MD

Anesthesiologist
Research Fellow
NYSORA, The New York School of Regional Anesthesia
New York, New York

Vikram Bansal, MD

Assistant Professor of Anesthesiology
Vanderbilt University Medical Center
Nashville, Tennessee

Michael J. Barrington, PhD

Professor, Centre for Integrated Critical Care | Department of
Medicine & Radiology | Melbourne Medical School
Faculty of Medicine, Dentistry and Health Sciences
The University of Melbourne, Victoria 3010 Australia
Senior Staff Anaesthetist
St. Vincent's Hospital Melbourne
Melbourne, Australia

Thomas Fichtner Bendtsen, MD, PhD

Professor of Anesthesiology
Aarhus University Hospital
Aarhus, Denmark

Siska Bjørn, BSc

PhD Fellow
Aarhus University Hospital
Aarhus, Denmark

Jan Boublik, MD, PhD

Clinical Assistant Professor
Stanford University
Stanford Medical School
Department of Anesthesiology, Perioperative and Pain Medicine
Stanford, California

Astrid De Bruyn, MD

Resident Anesthesiology
Jessa Hospital
Hasselt, Belgium

Donal J. Buggy, MD, FRCPI, FCAI, FRCA

Full Professor, Anaesthesiology & Perioperative Medicine &
Consultant in Anaesthesiology
Mater University Hospital, School of Medicine, University College
Dublin, Ireland

Christiana Burt, MA (Cantab), FRCA

Consultant Anaesthetist
Royal College of Anaesthetists College Tutor
Royal Papworth Foundation Hospital Trust
Cambridge, Cambridgeshire

Asokumar Buvanendran, MD

William Gottschalk Professor of Anesthesiology
Rush University Medical Center
Chicago, Illinois

Kenneth D. Candido, MD

Chairman
Advocate Illinois Masonic Medical Center
Professor of Anesthesiology and Surgery
University of Illinois
Chicago, Illinois

Kathleen Chan, MD

Fellow in the Division of Acute and Perioperative Pain Medicine
University of Florida College of Medicine
Gainesville, Florida

Franklin Chiao, MD, LAc

Director of Acute Pain Management
Attending Physician
Westchester Medical Center
Ardsley, New York

Ki Jinn Chin, MBBS(Hons), MMed, FRCPC
*Associate Professor, Department of Anesthesia
Toronto Western Hospital, University of Toronto
Toronto, Ontario, Canada*

Jason Choi, MD
*Attending Anesthesiologist
White Plains Hospital
White Plains, New York*

Stephen Choi, BSc, MD, FRCPC, MSc
*Staff Anesthesiologist, Sunnybrook Health Sciences Centre
Associate Professor, Department of Anesthesia,
University of Toronto
Toronto, Ontario, Canada*

Alwin Chuan, MBBS, PhD, FANZCA
*Conjoint Associate Professor, University of New South Wales
Director, Regional Anaesthesia Fellowship
Liverpool Hospital
Sydney, Australia*

**Cara Connolly, MB, BCh, BAO, LRCP & SI (Hons),
MSc, FCAI**
*Consultant Anaesthetist
Mater Misericordiae University Hospital
Dublin, Ireland*

Steve Coppens, MD
*Head of Clinic Anesthesiology
Fellowshipdirector Regional Anesthesia
University Hospitals Leuven
Leuven, Belgium*

Jennifer L. Cowell, MD
*Assistant Professor of Anesthesiology and Perioperative Medicine
Rutgers Robert Wood Johnson Medical School
New Brunswick, New Jersey*

Pieter Vander Cruyssen, MD, FIPP
*Anesthesiologist, Department of Anesthesiology
and Pain Management
AZ Maria Middelaes
Gent, Belgium*

Seppe Dehaene, MD
*Anesthesiologist
OLV van Lourdesziekenhuis
Waregem, Belgium*

Lejla Dervišević, MD
*Senior Teaching Assistant of Human Anatomy
Department of Human Anatomy
Medical Faculty University of Sarajevo
Sarajevo, Bosnia and Herzegovina*

Matthias Desmet, MD, PhD
*Consultant Anesthesist
AZ Groeninge
Kortrijk, Belgium*

Hesham Elsharkawy, MD, MBA, MSc, FASA
*Associate Professor of Anesthesiology Case Western
Reserve University
Staff, Departments of General Anesthesiology
and Outcomes Research
Anesthesiology Institute
Cleveland Clinic
Cleveland, Ohio*

Paul Fettes, MBChB, BSc
*Consultant Anaesthetist and Honorary Senior Lecturer
Department of Anaesthesia
Ninewells Hospital & Medical School
Dundee, United Kingdom*

Jeff Gadsden, MD, FRCPC, FANZCA
*Associate Professor of Anesthesiology
Chief, Division of Orthopedic, Plastic and Regional
Anesthesiology
Regional Anesthesiology and Acute Pain Medicine
Fellowship Director
Duke University Medical Center
Durham, North Carolina*

Tong J. Gan, MD, MBA, MHS, FRCA
*Professor and Chairman
Department of Anesthesiology
Stony Brook University
Stony Brook, New York*

Will Gauntlett, MBBCh, FRCA
*Consultant Anaesthetists
Alder Hey Children's Hospital
Liverpool, Cheshire*

Philippe Gautier, MD
*Head of Department
Department of Anesthesiology
Clinique Ste Anne-St Remi, CHIREC
Brussels, Belgium*

Liane Germond, MD
*Director Obstetric Anesthesia
Ochsner Health System
New Orleans, Louisiana*

Leen Govaers, MD
*Medical Doctor in Anesthesiology
Fellow in Regional Anesthesia
Universitair Ziekenhuis Leuven
Leuven, Belgium*

Admir Hadzic, MD, PhD

*Professor of Anesthesiology
Consultant, Anesthesiology, Intensive Care, Emergency Medicine
and Pain Therapy
Ziekenhuis Oost-Limburg
Genk, Belgium
Director, NYSORA, The New York School of Regional Anesthesia
New York, New York*

Thomas M. Halaszynski, DMD, MD, MBA

*Professor of Anesthesiology
Senior Director of Regional Anesthesia/Acute Pain Medicine
Yale University School of Medicine
New Haven, Connecticut*

Brian E. Harrington, MD

*Staff Anesthesiologist
Billings Clinic Hospital
Billings, Montana*

Ilvana Hasanbegovic, MD

*Associate Professor of Anatomy
Department of Anatomy
Faculty of Medicine
University of Sarajevo
Sarajevo, Bosnia and Herzegovina*

Daryl Steven Henshaw, MD

*Associate Professor of Anesthesiology
Medical Director Section of Regional Anesthesia
and Acute Pain Management
Wake Forest School of Medicine
Winston Salem, North Carolina*

Jacob Hutchins, MD, MHA

*Director of the Division of Regional Anesthesia,
Acute Pain, and Ambulatory Anesthesia
University of Minnesota Hospital
Minneapolis, Minnesota*

Barys Ihnatsenka, MD

*Associate Professor of Anesthesiology
College of Medicine, University of Florida
Gainesville, Florida*

Vivian H. Y. Ip, MBChB, FRCA

*Associate Clinical Professor
University of Alberta Hospital
Edmonton, Canada*

J. Douglas Jaffe, DO, FASA

*Fellowship Director: Regional Anesthesiology and
Acute Pain Medicine
Associate Professor of Anesthesiology
Wake Forest School of Medicine
Wake Forest Baptist Hospital
Winston Salem, North Carolina*

Hassanin Jalil, MD

*Anesthesiologist
Intensive Care Specialist
Regional Anesthesia, NYSORA
Hasselt, Jessa Hospital
Hasselt, Belgium*

Hari Kalagara, MD, FCARCSI, EDRA

*Assistant Professor of Anesthesiology
The University of Alabama at Birmingham (UAB)
Birmingham, Alabama*

Sowmya Kantamneni, MD

*Fellow in the Division of Acute and Perioperative Pain Medicine
University of Florida College of Medicine
Gainesville, Florida*

Gary Kao, MD

*Interventional Pain Physician
Tricity Pain Associates
Corpus Christi, Texas*

Manoj K. Karmakar, MD, FRCA, DA (UK), FHKCA, FHKAM

*Director of Paediatric Anaesthesia
Department of Anaesthesia and Intensive Care, Faculty of
Medicine, The Chinese University of Hong Kong
Hong Kong, SAR, China*

Brendan Keen, MD

*Anesthesiologist
US Anesthesia Partners Colorado
Denver, Colorado*

James K. Kim, MD

*Assistant Professor
University of Pennsylvania Health System
Philadelphia, Pennsylvania*

Jung H. Kim, MD

*Assistant Professor
Icahn School of Medicine at Mt. Sinai St. Luke's
and Mt. Sinai West Hospitals
New York, New York*

Nebojsa Nick Knezevic, MD, PhD

*Vice Chair for Research and Education
Advocate Illinois Masonic Medical Center
Associate Professor of Anesthesiology and Surgery
University of Illinois
Chicago, Illinois*

Sree Kolli, MD, EDRA

*Staff Anesthesiologist
Associate Director Acute Pain/Regional Anesthesia
Cleveland Clinic
Cleveland, Ohio*

Samantha Kransingh, MD

Anesthesiologist Fellow in Regional Anesthesia
Department of Anesthesiology, Intensive Care, Emergency
Medicine and Pain Therapy
Ziekenhuis Oost-Limburg
Genk, Belgium

Alison Krishna, MD

Assistant Professor of Anesthesiology
Mount Sinai St. Luke's and Mount Sinai West
Department of Anesthesiology
New York, New York

Lisa Kumar, MD

Anesthesiologist
Baptist Hospital of Miami
Miami, Florida

Maxine M. Kuroda, PhD, MPH

Epidemiologist/Biostatistician
NYSORA
New York, New York

M. Kwesi Kwofie, MD, FRCPC

Director of Regional Anesthesia and Acute Pain
Assistant Professor
Department of Anesthesia, Pain Management
and Perioperative Medicine
Dalhousie University
Halifax, Nova Scotia, Canada

Malikah Latmore, MD

Assistant Professor of Anesthesiology
Mount Sinai St. Luke's and West Hospitals
New York, New York

Chad Lee, MD

Interventional Pain Physician
Georgia Pain and Wellness Center
Atlanta, Georgia

Ine Leunen, MD

Anesthesiologist
Intensive Care Medicine
AZ Turnhout
Turnhout, Belgium

Matt Levine, MBChB, FANZCA

Specialist Anaesthetist
Capital and Coast District Health Board
Wellington, New Zealand

Ana M. Lopez, MD, PhD, DESA

Visiting Professor, KU Leuven
Consultant Anesthesiology
Ziekenhuis Oost-Limburg
Genk, Belgium

Sofie Louage, MD

Anesthesiologist-Intensivist
AZ Glorieux
Ronse, Belgium

Belen De Jose Maria, MD, PhD, ECFMG

Consultant in Pediatric Anesthesia
Hospital Sant Joan de Deu, University of Barcelona
Barcelona, Spain

Colleen Mccally, DO

Assistant professor of Anesthesiology
Assistant Director of East Hills ASC
St Francis Hospital
Roslyn, New York

Colin J. L. McCartney, MBChB, PhD, FRCA, FRCPC

Professor and Chair of Anesthesiology and Pain Medicine
University of Ottawa
Ottawa, Ontario, Canada

Shaun De Meirsmen, MD

President Belgian Anesthesia Trainees
University Hospitals Leuven
Leuven, Belgium

Justin Morello, MD

Department of Anesthesiology
Ochsner Clinic Foundation
New Orleans, Louisiana

Hiroaki Murata, MD, PhD

Associate Professor
Department of Anesthesiology
Nagasaki University Graduate School of Biomedical Sciences
Nagasaki, Japan

Tatsuo Nakamoto, MD, PhD

Professor of Anesthesiology
Director Regional Anesthesia/Pain Medicine
Kansai Medical University Hospital
Hirakata, Osaka, Japan

Kristof Nijs, MD

Anesthesiology Resident
Jessa Hospital
Hasselt, Belgium

John-Paul J. Pozek, MD

Assistant Professor of Anesthesiology
Residency Research Coordinator
The University of Kansas Health System
Kansas City, Kansas

Stavros Prineas BSc(Med), MBBS, FRCA, FANZCA

Specialist Anaesthetist
Nepean Hospital
Sydney, Australia

John Rae, FRCA, FFICM

*Specialty Registrar in Anaesthesia
Ninewells Hospital
Dundee, United Kingdom*

Pascal A. Ramsodit, MSc, MD

*Anesthesiologist and Chronic Pain Specialist.
Dijklander Ziekenhuis
Hoorn, The Netherlands*

Kasra Razmjou, MD

*Assistant Professor of Anesthesiology
Medical Director, Acute Pain Service
MedStar Georgetown University Hospital
Washington, DC*

Bernard Roach, MBBS, PGClinUS, FANZCA

*Specialist Anaesthetist
Liverpool and Wollongong Hospitals
New South Wales, Australia*

Christopher B. Robards, MD

*Assistant Professor of Anesthesiology
Mayo Clinic Florida
Jacksonville, Florida*

Steve Roberts, MBChB, FRCA

*Consultant Anaesthetist
Alder Hey Children's NHS Foundation Trust
Liverpool, United Kingdom*

Meg A. Rosenblatt, MD, FASA

*Professor of Anesthesiology and Orthopedics Icahn
School of Medicine at Mount Sinai
Chair, Department of Anesthesiology, Perioperative
and Pain Medicine
Mount Sinai St. Luke's and West Hospitals
New York, New York*

Siddharth Sata, DO

*Assistant Professor of Anesthesiology
Duke University School of Medicine
Durham, North Carolina*

Sebastian Schulz-Stübner, MD PhD

*Privatdozent in Anesthesia
Chief Physician
German Consulting Center for Infection Control
and Prevention (BZH GmbH)
Freiburg, Germany*

Ali Shariat, MD

*Assistant Professor of Anesthesiology
Mount Sinai West and St. Luke's Hospitals
New York, New York*

Uma Shastri, MD, FRCPC

*Assistant Professor of Anesthesiology
Vanderbilt University
Nashville, Tennessee*

Yanxia Sun, MD, PhD

*Chairman
Department of Anesthesiology
Beijing Lu Dao Pei Hospital
Staff Anesthesiologist
Department of Anesthesiology
Beijing TongRen Hospital
Capital Medical University
Fengtai, China*

Evan Sutton, MD

*Anesthesiologist
Bend Anesthesiology Group
Bend, Oregon*

Tiffany Tedore, MD

*Associate Professor of Anesthesiology
Co-Director, Regional Anesthesiology and Acute Pain Medicine
New York Presbyterian Hospital
Weill Cornell Medical College
New York, New York*

Antony R. Tharian, MD

*Program Director
Advocate Illinois Masonic Medical Center
Assistant Professor of Anesthesiology
University of Illinois
Chicago, Illinois*

Luc Tielens, MD

*Paediatric Anesthesiologist
President of the Dutch Association for Regional
Anesthesia (DARA)
Radboudumc
Nijmegen, The Netherlands*

**Ban C.H. Tsui, Dip Eng, BSc(Math), B.Pharm,
MSc, MD, FRCP(C), PG Dip Echo**

*Professor
Director, Stanford University Pediatric Regional
Anesthesia (SUPRA)
Director of Research, Division of Adult Regional Anesthesia
Department of Anesthesiology, Perioperative and Pain Medicine,
Stanford University
Stanford, California*

Vishal Uppal, MBBS, DA, EDRA, FRCA

*Assistant Professor & Staff Anesthesiologist Director, Regional
Anesthesia Fellowship Program Department of Anesthesia,
Pain Management & Perioperative Medicine Dalhousie
University, Halifax
Halifax, Nova Scotia, Canada*

Sam Van Boxtael, MD

*Consultant in Emergency Medicine, Anesthesiology and ICU
Ziekenhuis Oost-Limburg
Genk, Belgium*

Catherine Vandepitte, MD, PhD

*Consultant Anaesthesiologist
Kritieke Diensten
Ziekenhuis Oost-Limburg
Genk, Belgium*

Cedric Van Dijck, MD

*Dept. of Anesthesiology, Emergency Medicine & Critical Care
Ziekenhuis Oost-Limburg
Genk, Belgium*

Pascal Vaneldereren, MD, PhD

*Head of the Emergency Department
Ziekenhuis Oost-Limburg
Genk, Belgium
Professor at the Faculty of Medicine and Life Sciences
Hasselt University
Diepenbeek, Belgium*

Astrid Van Lantschoot, MD

*Staff member anesthesiology
ZOL Genk
Genk, Belgium*

Thibaut Vanneste, MD

*Anesthesiologist
Hospital Oost-Limburg
Genk, Belgium*

André Van Zundert, MD, PhD, FRCA, EDRA, FANZCA

*Professor & Chairman Discipline of Anesthesiology
The University of Queensland—Faculty of Medicine &
Biomedical Sciences
Chair, University of Queensland, Burns, Trauma & Critical Care
Research Centre
Chair, RBWH/University of Queensland, Centre for Excellence
& Innovation in Anaesthesia, Department of Anaesthesia &
Perioperative Medicine
Queensland, Australian*

Tom C. Van Zundert, MD, PhD, EDRA, FANZCA

*Udayana University, Bali, Indonesia
Ziekenhuis Oost Limburg
Genk, Belgium*

Alexandru Visan, MD, MBA

*CEO, Executive Cortex Consulting
Miami, Florida*

Alexander Vloka, MD

*Internal Medicine Resident
Boise VA Medical Center
Boise, Idaho*

Philippe Volders, MD

*Department of Anesthesia and Critical Care
Regional Anesthesia
Algemeen Ziekenhuis Diest
Diest, Belgium*

Christopher Wahal, MD

*Assistant Professor of Anesthesiology
Department of Anesthesiology
Sidney Kimmel Medical College at Thomas Jefferson University
Philadelphia, Pennsylvania*

Takayuki Yoshida, MD, PhD, EDRA

*Assistant Professor
Department of Anesthesiology
Kansai Medical University Hospital
Hirakata, Osaka, Japan*

Adam C. Young, MD

*Assistant Professor of Anesthesiology & Pain Medicine
Co-Director, Acute Pain Service Assistant Professor
Anesthesiology & Interventional Pain Medicine
Rush University Medical Center
Chicago, Illinois*