Injuries are estimated to become the number-one cause of death for men and women under the age of 45 by the year 2020. Trauma patients present unique challenges to anesthesiologists. Acute injuries require resource-intensive care and are often complex cases, especially when coupled with underlying, pre-existing medical conditions. Anesthesiologists are involved with trauma patients beginning with airway and shock resuscitation, continuing with intraoperative care during surgery, and extending on to pain management and critical care postoperatively. This new reference focuses on a broad spectrum of traumatic injuries and the procedures anesthesiologists perform to adequately care for trauma patients perioperatively, surgically, and postoperatively. Special emphasis is given to the assessment and treatment of coexisting disease. Numerous tables and more than 300 illustrations showcasing various techniques of airway management, shock resuscitation, echocardiography, and use of ultrasound for the performance of regional anesthesia in trauma provide an invaluable reference for the anesthesiologist.

Dr. Charles E. Smith is board-certified in anesthesiology and in perioperative transesophageal echocardiography, has expertise in trauma care, and has published extensively on topics in trauma anesthesia.
TRAUMA ANESTHESIA

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FOREWORD

Dr. Charles E. Smith has been inspiring improved anesthesia for the victims of traumatic injury for many years, having spent the majority of his career at MetroHealth Medical Center, Cleveland, Ohio, which is the city's major trauma center. He has regularly served as lecturer in refresher courses for the International Trauma Anesthesia and Critical Care Society (now called International TraumaCare). He is a productive author of innovative research in the care of the traumatized patient. These attributes easily qualify him to be editor of a multi-authored comprehensive book on trauma anesthesia, to which he is also a major contributor. His invited chapter authors are similarly qualified. The result is an authoritative, readable, and educational resource for the student, resident, or practitioner wishing to stay abreast of a rapidly changing field.

Epochal changes have occurred in the practice of anesthesiology in the last ten years. Improved monitors, safer drugs, and better-trained anesthesiologists, nurse anesthetists, and anesthesia assistants have all reduced the morbidity and mortality of anesthesia. Anesthesia has become safer. Safer anesthesia improves the outcome of traumatic injuries. Our surgical colleagues have contributed to the improvements in trauma care.

Innovations in the care of serious fractures, use of damage control in abdominal injuries, and improved care of burns have reduced morbidity and mortality. Dr. Smith has included all of the latest innovations in this text. Despite the advances, the importance of trauma as a cause of disability and lost life remains and, in fact, when expressed as a proportion to overall mortality in young people, is increasing in importance.

Throughout history significant advances have been made in anesthetic care during times of war. The war in Iraq is no exception, and the lessons learned in that conflict are included. The technology of vascular access has greatly improved. Ultrasonic localization of major veins for central access is a major advance greatly enhancing safety for the patient. The techni-que of intraosseous infusion was once painful and cumbersome to establish, such that it was considered a circus stunt and not of much practical value. Newly designed equipment has revolutionized the technique. It is now fast, painless, convenient, and effective in any patient with difficult IV access. Having established vascular access, the choice and volume of fluid therapy is critical to survival and outcome of the traumatized patient. This book discusses the established and the controversial concepts. Also discussed is a new protocol-driven, multidisciplinary approach to massive transfusion. This approach, which requires cooperation between the blood bank, the trauma surgeons, and anesthesiologists, takes the guesswork out of massive transfusion. No longer do we have to stand at the OR table and ponder, “Is it time for platelets and fresh frozen plasma?” These collaborative decisions have been made in advance, and all we have to do is to activate the protocol and administer whatever comes in the incremental allotments.

Patients now expect to be relieved of significant pain, and pain is considered the fifth vital sign. Significant advances have been made in the techniques for relief of acute traumatic and postoperative pain. Entire teams of people are now dedicated to this practice. Nobody questions the value of pain relief, but it comes with some risk. A multimodal approach appears to accomplish the goal and simultaneously minimize the risks.

Thermal injuries, brain injuries, and spinal cord injuries are specialized forms of trauma that are occasionally neglected. These injuries are contraindicated in the management of orthopedic injuries are contraindicated in neurologic injuries. We must be able to recognize these conflicts when they occur together in the same patient and create an anesthetic plan that will benefit the patient.

Dr. Smith and his invited authors have done a magnificent job of pulling together the diverse concepts of the management of the traumatized patient and presenting us with a valuable resource for the anesthesiologist. Although directed at the anesthesiologist, the text is useful for emergency medicine physicians, surgeons, orthopedists, and, in fact, any health care professional who deals with trauma. Congratulations to the entire group of authors!

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The challenge of managing seriously injured patients encompasses an expanse of issues linked by a common factor – trauma. In these critical situations, anesthesiologists are often faced with the need to simultaneously address emergent airway management, resuscitation, massive blood loss, acidemia, coagulopathy, hypothermia, and the consequences of damage to various organs. The management of each of these conditions alone can be essential for survival, and their convergence presents a unique situation in which the likelihood of death or a bad outcome is real. Success in this stressful situation requires a sophisticated understanding of basic sciences and expertise in the clinical and technical skills of anesthetic management. Together, the anesthesiologist and trauma surgeon must orchestrate the human and physical resources of the trauma center with a patient’s life on the line.

Recent advances in the field of trauma anesthesiology parallel those in other related medical disciplines. Concepts promulgated by experiences in recent military conflicts have affected resuscitation and the use of blood products. The adoption of damage control operations and the use of simultaneous surgical teams to address multiple critical injuries have improved survival. Rules regarding the transfusion of blood and blood components and the use of recombinant clotting factors such as Factor VII concentrate have led to a “sea change” in trauma management that has resulted in the survival of soldiers and others injured under war conditions beyond what was thought possible just a few years ago. These concepts have been readily adopted in civilian trauma centers. The intensity associated with their use has placed an increased demand on anesthesiologists who are already taxed in their care for the critically injured.

This excellent book addresses these important and evolving changes in management of the injured patient as well as more traditional issues in trauma anesthesia. The breadth of topics addressed by the authors reflects the challenges and complexities of anesthesia-related care for victims of traumatic injury. Trauma surgeons realize the tremendous importance of coordinated care promulgated at trauma centers and by trauma systems. Injury accounts for more lost productive years of life than any other disease; therefore, survival and ultimate return to an acceptable level of function are important outcome parameters both for the patient, their loved ones, and our society. Because many seriously injured patients will require an operation, the anesthesiologist is an important link in the coordinated approach to trauma care and must be aware of the unique problems related to managing injury. That is why this book is such an important contribution for anesthesiologists who care for trauma patients.

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Trauma is a leading cause of death and disability in modern society. Trauma will continue to be a leading cause of death well into the future. We are all vulnerable to traumatic injury. Managing adult and pediatric victims of major trauma and burns continues to be a great challenge requiring a tremendous amount of dedication and resources. The overall aim of this book is to review the anesthesia considerations for trauma patients and to provide a rational approach to choice of anesthetic techniques and drugs for injured patients. To accomplish this, I have assembled an outstanding group of clinicians who regularly care for trauma patients at major trauma centers. Each of them was asked to contribute a chapter that would provide an in-depth discussion on their areas of expertise and that would concentrate on clinical aspects of trauma management. I have selected members of my hospital to assist with this textbook, as well as notable contributors from other major centers around the globe.

The book consists of thirty-seven chapters that deal in detail with pertinent areas of trauma care, such as airway and shock management, monitoring, vascular access, pharmacology of anesthetic drugs, fluid and blood resuscitation, and the treatment of acute and chronic pain after injury. For several patterns of injuries, including extremity and pelvis, spinal cord, burns, cardiac, and great vessel, surgical considerations and management principles are presented in the reader in the chapter preceding the one dealing with anesthesia considerations. Specific chapters review the anesthesia considerations of vulnerable patient populations such as elderly, pediatric, pregnant, and military patients. Other sections deal with important issues of trauma care, including damage control in severe trauma, hypothermia in trauma, mechanical ventilation in critically injured patients, and use of echocardiography and ultrasound in trauma. Training for trauma, including the use of simulation and the role of trauma care systems in facilitating the allocation of resources for optimally managing injured patients are also covered.

I hope that this book will be of use for anesthesia care providers who are faced with caring for trauma patients at all hours of the day and night. I am certain that the text will benefit anesthesia residents and staff of major trauma centers, help pave the way to improved care of the injured, and stimulate future advances in trauma care.

Charles E. Smith, MD, FRCP
I would like to thank my mentors in anesthesia from McGill University – Drs. David Bevan, François Donati, and Earl Wynands – for providing teaching and inspiration, instilling in me the confidence to manage complex patients, and stimulating my interest in clinical research. I am indebted to all the staff at MetroHealth Medical Center who work long and hard to transport, stabilize, diagnose, treat, and rehabilitate victims of blunt and penetrating injury. Thanks to my associate editor, John Como, and to the many contributors to this book for sharing their experience and knowledge. I am grateful to Marc Strauss of Cambridge University Press, who first approached me with the formidable task of organizing this book, and to Peg Brady for her tireless secretarial assistance. Appreciation goes to Peggy Rote, Monica Finley, Angela Weaver, Frank Scott, and the staff at Cambridge for their efforts in seeing this book through to publication. I would also like to thank my colleagues at the International Trauma Anesthesia and Critical Care Society (ITACCS, now called International TraumaCare) who have been a source of strength and guidance, in particular, Chris Grande, Buddy Giesecke, John Stone, and Eldar Søreide for their friendship and support. The love and encouragement of my parents, my wife, Bobby, and my children, Adrienne, Emily, and Rebecca, was ever present and much appreciated.

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