

*Michael J. Avram, Ph.D., Editor*

### **Monitoring in Anesthesia and Perioperative**

**Care.** Edited by David L. Reich, M.D., Ronald Kahn, M.D., Andrew B. Leibowitz, M.D., Alexander J. C. Mittnacht, M.D., Marc E. Stone, M.D., James B. Eisenkraft, M.D. New York, Cambridge University Press, 2011. Pages: 432. Price: \$125.00.

Patient safety has improved tremendously since the first public demonstration of anesthesia in the Ether Dome in 1846. The evolution of anesthesia care from a clinical art to a systematic, modern science has been led, in large part, by dramatic advancements in our ability to monitor patients. Accordingly, much of the significant decline in anesthesia-related morbidity and mortality (especially in the last 40 yr) can be directly attributed to improved patient monitoring during the perioperative period.

*Monitoring in Anesthesia and Perioperative Care* aims to describe not only the historical art but also the modern science and technology that form the basis of perioperative patient monitoring. It chronicles monitoring from its conception by such visionaries as Harvey Cushing and Arthur Guedel through modern-day investigational modalities not yet used in clinical practice. It describes a wide range of monitoring options and offers advice from leading experts regarding the risks, benefits, and applicability of each modality.

The book is generally organized into three sections. The first four chapters deal with historical developments, medicolegal implications, and educational concerns related to monitoring in general. This is followed by the bulk of the text, which is organized into chapter-by-chapter reviews of physiologic and biochemical monitoring modalities. Whenever possible, each of these chapters is organized around six themes: technical concepts, parameters measured, evidence of utility, complications, credentialing and standards, and practice guidelines. The final chapters address various scales and schemata used to assess perioperative and critical-care patients beyond routine vital sign assessment. The text concludes with a chapter on the convergence of clinical monitoring with electronic medical records, highlighting the coming of age of anesthesia information management systems.

As one would expect, the text educates the reader on commonly used monitors, such as those required by the American Society of Anesthesiologists. It also serves as a primer for less common and investigational techniques, including the use of near-infrared spectroscopy to assess regional tissue perfusion. The chapter on perioperative monitoring of neuromuscular function is particularly valuable as it provides poignant insight into a topic of ongoing debate in the literature. The book also includes multiple chapters that discuss ancillary monitoring modalities, such as fetal heart rate monitoring and neurophysi-

ologic monitoring. At the end of the second section, the authors include several chapters relating to perioperative laboratory assessment, such as assessment of coagulation status and cardiac biomarkers.

We applaud the authors' attempts to synthesize multiple aspects of perioperative monitoring into a comprehensive, yet approachable text. However, there are several notable shortcomings. Although individual chapters are well organized, the overall flow of the text does not seem to follow a logical order. The chapter on gastric tonometry, for example, appears in the text several hundred pages before the discussions of pulse oximetry and temperature measurement. By beginning with the American Society of Anesthesiologists' standard monitors, and following with chapters based on organ systems, the text would likely flow better. However, a concise table of contents and a thorough index do help to ameliorate this concern.

In addition, the mostly black-and-white (and often low-resolution) photos are not what one would expect from an expensive and otherwise high-quality medical text. Finally, although there is an inevitable time lag between the writing and publication of any textbook, this is even more apparent in this text, which chronicles a rapidly changing technological landscape.

Overall, *Monitoring in Anesthesia and Perioperative Care* is a thorough and well written resource for clinicians seeking an improved understanding of modern anesthesia monitoring practices. With the ever-increasing quantity and sophistication of monitoring modalities, the potential exists for a concomitant rise in the hazards of such a complex system. Fortunately, *Monitoring in Anesthesia and Perioperative Care* provides the reader with a solid foundation for seeking an optimal balance between improved patient care and "monitoring overload."

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### **Monitoring the Nervous System for Anesthesiologists and Other Health Care**

**Professionals.** Edited by Anton Koht, M.D., Tod B. Sloan, M.D., M.B.A., Ph.D., J. Richard Toleikis, Ph.D. New York, Springer, 2012. ISBN-10: 1461403073. ISBN-13: 978-1-4614-0307-4. eISBN: 978-1-4614-0308-1. Pages: 846. Price: \$89.95.

Although there are many texts and peer-reviewed publications that address intraoperative monitoring of various aspects of the nervous system, few are directed specifically at

healthcare providers not actually performing or interpreting the monitoring. Unless a clinician has specific education in neurophysiology, neuropharmacology, neuroanatomy, and technical aspects of recording neurophysiologic signals, most available texts will be very difficult reading. This text was written specifically to provide needed information to healthcare providers, especially anesthesiologists, who have a key role in optimizing conditions for monitoring to provide useful and interpretable information.

The tone for the text is set nicely by forewords written by three individuals (Clyde Nash, M.D., orthopedic spine surgeon; Maurice Albin, M.D., neuroanesthesiologist; and H. Hunt Batjer, M.D., neurosurgeon), some of whom have been actively involved in neuromonitoring since its functional beginning a half century ago.

The book is divided into four major sections addressing techniques of monitoring, anesthetic considerations, case-based presentations, and monitoring in the intensive care unit. The first section provides a succinct, well-referenced review of each of the important methods of monitoring the nervous system encountered in the operating room or in the intensive care unit. The techniques discussed are separated logically into those that monitor neurologic function (sensory and motor evoked potentials, spinal cord stimulation techniques, electroencephalography, and electromyography), adequacy of blood flow (near-infrared spectroscopy, transcranial Doppler ultrasound, and jugular venous oxygen saturation), structural localization techniques (deep brain stimulation and cortical mapping), and intracranial pressure monitoring. For each monitoring modality, an anatomic basis for monitoring is provided that demonstrates why monitoring a particular pathway would logically provide information about a particular portion of the nervous system. This discussion also provides the clinician with an understanding of the anatomically based limitations of each type of monitoring. Next, methods and technical considerations are described. This description is complete enough to provide a good understanding of what monitoring technologists must do in preparation for and during monitoring but not so comprehensive as to be difficult to understand for those who are not neurologists or neurophysiologists. Third, nonsurgical factors that may make monitoring difficult to interpret, including but not limited to anesthetic drugs and temperature, are reviewed. Finally, the most important applications of each monitoring modality and some evidence-based literature are reviewed. These discussions are limited in scope by design because the entire third section of the book addresses applications of monitoring in specific cases.

The second major section of the book has three chapters that focus on the anesthesia provider. Because cortical functional mapping and surgery for placement of deep brain stimulating electrodes usually require an awake, cooperative patient, there is an excellent discussion about anesthesia for awake neurosurgical procedures. This chapter covers the important aspects of management, including preoperative eval-

uation and patient selection, sedation techniques that do not significantly impair the neurologic examination, regional anesthetic techniques that may be useful adjuncts, and complications related to surgery and anesthetics that may occur during surgery. The second chapter provides a succinct review of the interpretative difficulties general anesthesia introduces for each monitoring technique and suggests ways anesthesia providers may facilitate neurologic monitoring. The final chapter of this section, "Monitoring Anesthetic Effect," not only reviews how the electroencephalogram can be used for monitoring drug effects in both the operating room and intensive care unit but also discusses how the electroencephalogram can be used to monitor metabolic suppression and detect ischemia. Computer processing and display simplification of the electroencephalogram are addressed, demonstrating how the anesthesiologist, who is also responsible for monitoring other organ systems, may efficiently gain information about central nervous system drug effects and cerebral ischemia.

The third and largest section of the text is what really distinguishes this work from other texts covering the same topic. Although it is well and good to provide theoretical background and outcome data for each monitoring modality, the anesthesiologist will not really learn how to optimize his or her practice for use during monitoring and will not really understand just how important this monitoring can be to the patient's well-being until real clinical experience is gained with monitoring. The anesthesiologist will be convinced of the importance of controlling for confounding factors during critical monitoring periods upon actually seeing a surgeon place an aneurysm clip (which appears by all assessments to be well placed) cause a loss of cortical somatosensory evoked response that returns after the clip is adjusted. Each chapter focuses on neurologic monitoring during cases the practicing neuroanesthesiologist is likely to encounter. Considering this section as a whole, nearly all common applications of the monitoring techniques described in the first section of the book are reviewed in an easy-to-read, case discussion format. The cases were selected to demonstrate the utility, limitations, and confounding factors during surgery that may make interpretation difficult and often involve multiple modalities simultaneously. Real patient examples, with all identification removed, show how vitally important the information provided by neurologic monitoring can be to all personnel taking care of the patient and effectively demonstrate how the real-time information provided by monitoring enables the surgeon and anesthesiologist to work together to restore function to nervous tissue identified to be at risk. Some cases were clearly selected to demonstrate the effects of poor control of the anesthetic technique, technical factors that may cause evoked potential changes, positioning effects, and limitations of monitoring techniques (false negatives). By selecting these cases, the editors provide an appropriate balance between demonstrated efficacy and limitations of each monitoring technique.

The final section of the book provides a brief glimpse into the potential uses of neurologic monitoring in the intensive care unit, focusing on cerebral blood flow measurement modalities. This text emphasizes the far more commonly used and more extensively studied intraoperative applications of neurologic monitoring. This choice of emphasis is understandable because, relatively speaking, intensive care unit neuromonitoring is still in its infancy. Most intensive care unit applications of neuromonitoring are really not monitoring, but rather diagnostic snapshots. If there is any weakness to this text, it is in this area. Intensive care unit applications are covered to some extent in the first section of the book, and this section almost appears to be an afterthought.

In summary, *Monitoring the Nervous System for Anesthesiologists and Other Health Care Professionals* is a must read for trainees undertaking a fellowship in neuroanesthesia and for neuroanesthesiologists who are not themselves directing a neurologic monitoring service or who have limited experience with neurologic monitoring. This book would also be a useful adjunct for trainees in clinical neurophysiology who intend to focus a significant portion of their professional effort on intraoperative neurologic monitoring.

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