oxygen supply. For almost a century the "cylinder" model of August Krogh has been the basis of our understanding of capillary oxygen diffusion. According to that model a single capillary provides oxygen to a surrounding tissue cylinder, and oxygen diffusion results in linear decreases in oxygen content from arteriole to venule. There is the intriguing possibility that diffusion of oxygen into the tissues occurs not just in the capillaries but also across the walls of all the vessels of the microcirculation.

The microcirculation is not a static arrangement of blood-carrying vessels. Instead, it is an active, heterogeneous network that continuously directs blood flow to different areas of tissue, according to metabolic need. The signals that control microvascular blood flow are unknown, but it appears that oxygen sensing is a property of cells that enables them to remain functional under conditions of variable oxygen supply. Evidence is accumulating that a heme protein may be involved in this process. Further, it is now apparent that capillaries are not inert conduits for the diffusion of oxygen into the tissues, but that they have a high rate of oxygen consumption. Moreover, capillary wall metabolism may be a regulator of oxygen transfer to the tissues, a theory that may explain the disastrous consequences of capillary failure in shock.

The next section of the book explores the physiologic consequences of hypoxia. The first 3 chapters of this section offer an excellent review of the various mechanisms by which cells can be deprived of oxygen: decrease in arterial oxygen content (hypoxic hypoxia), decrease in cardiac output (circulatory hypoxia), and decrease in hemoglobin concentration (anemic hypoxia). In particular, the chapter on hypoxic hypoxia provides a remarkably clear discussion of the various metabolic and physiologic mechanisms at play during decreases in P_{aO_2}, including diffusion limitation, hypoventilation, shunt, ventilation/perfusion mismatch, and mixed venous P_{O_2}. The last 4 chapters of this section explore the role of mitochondrial dysfunction during hypoxia and shock states. The intriguing concept of cytopathic hypoxia suggests that although oxygen may be offered to the tissues by a functioning microcirculation, the cells may be unable to use it. Diseases states, such as sepsis, may affect the cell's mitochondria, preventing these organelles from metabolizing oxygen at a rate commensurate with cellular energy needs. This theory is supported by experimental data that show high tissue P_{O_2} concentrations in sepsis and elevated tissue lactate. Moreover, it is possible that cells may have developed an adaptive response to prolonged periods of hypoxia by detecting hypoxia via oxygen-sensing mechanisms involving the mitochondria and lowering cellular energy utilization during conditions of decreased oxygen supply. A chapter is devoted to the notion that hypoxic states, in particular those followed by reoxygenation, may transform the mitochondria from a life-giving organelle to an instrument of cellular death. This transformation may occur through the process of mitochondrial permeability transition, which increases mitochondrial matrix calcium concentration and eventually results in apoptosis and cell death.

The third section of the book is devoted to the methodology of measuring microvascular perfusion and tissue oxygenation. The section begins with a discussion of the available clinical measures of tissue oxygenation: oxygen delivery, oxygen consumption, and oxygen extraction ratio. Also discussed are the roles of lactate and gastric intramucosal pH. There is an excellent chapter on microcirculatory techniques that describes intravital video microscopy to measure microcirculatory flow in experimental preparations, as well as techniques with potential clinical applications, such as laser Doppler flowmetry and perfusion-sensitive magnetic resonance imaging. Spectrophotometric techniques to measure hemoglobin saturation in arterioles, capillaries, and venules are also described in sufficient detail to be understood by those not well versed in the subject. There is a comprehensive, albeit brief, discussion of several methods available for the direct measurement of tissue oxygen concentration. These methods include polarographic electrodes, optodes, near-infrared spectroscopy, nicotinamide adenine dinucleotide with high-energy hydrogen (NADH) fluorescence, reflectance spectrometry, and Pd-porphyrin phosphorescence.

The last section covers blood substitutes, including hemoglobin solutions, diaporin cross-linked hemoglobin, and perfluorocarbons as oxygen carriers. This section provides sufficient background and historical perspective to understand newer developments in this rapidly changing field.

This is not a book intended for the uninitiated reader seeking a superficial review of oxygen transport physiology. Many of the chapters assume a fair degree of background knowledge by the reader. Moreover, little of the information presented has clinical relevance. Specifically, those interested in respiratory care may be disappointed by few references to lung disease in relation to tissue oxygenation. While providing an excellent background on current understanding of microcirculatory phenomena and the physiologic and metabolic consequences of tissue hypoxia, the book contains little information on the causative relationship of pulmonary dysfunction to arterial and tissue hypoxia. Further, many of the chapters delve into evolving concepts that are in early stages of development, many of which may not survive the test of time.

Given that the initial hard-cover edition was published in 1998, some of the information contained in the book is already dated. On the other hand, for those interested in the mechanisms and consequences of tissue hypoxia, the book provides an excellent platform from which to jump into the current literature.

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Critical Care Medicine: Perioperative Management, 2nd edition. Michael J Murray MD PhD, Douglas B Coursin MD, Ronald G Pearl MD PhD, and Donald S Prough MD, editors. Philadelphia: Lippincott Williams & Wilkins. 2002. Hard cover, illustrated, 905 pages, $149.

The transition of a critically ill patient from the operating room to the intensive care unit (ICU) is often a particularly challenging time. Thus, creating a reference book that has that period as its primary focus would also seem to be a challenge. The second edition of **Critical Care Medicine: Perioperative Management** takes on this challenge with a combination of dexterity and efficiency that will make it a valuable addition to the bookshelves of critical care practitioners at many levels.

The editors indicate that new developments in critical care technology and therapeutics motivated the publication of a second edition, and to address those developments they added 5 new chapters, the focus of which is how new information technology and biotechnology can improve care of the critically ill. This text may be useful for any health care provider working

in the postoperative ICU, but it will be most useful to medical students and physicians who require brief overviews on a variety of topics. The second edition maintains the same organization and style of the first edition, with revised and updated chapters.

There is already an abundance of references and handbooks devoted to the care of patients during anesthesia and surgery and in the ICU. I approached this text with a simple question: "Does it provide any benefit over a combination of the specialty texts?" Though some chapters offer no more or new insight than one can obtain in an anesthesiology or critical care textbook, the sum of the chapters does provide a coherent resource for management of the critically ill patient in the perioperative period. Though the focus of the text is the perioperative period, the information and approach are certainly more widely applicable to the care of critically ill patients.

This second edition of **Critical Care Medicine: Perioperative Management** is published by Lippincott Williams & Wilkins for the American Society of Critical Care Anesthesiologists. The book is bound in a simple red leather-like cover with a gold lettered typeface and does not have a dust jacket. I was pleasantly surprised with the durability of both the binding and the cover. During the time I evaluated the book, I frequently subjected it to the abuse of an overloaded briefcase. The cover survived this trauma with only minor blemishes and the corners (often the Achilles heel) remained square and crisp. At 905 pages the book is large, heavy, and probably at the acceptable limit for a single-volume reference. Despite the book's size and weight, the binding has held up well and shows no sign of failure. The paper is heavy stock that is durable and easily handled. One can reasonably expect that this book will remain intact through years of routine use. The typeface is not specified, but it is sans-serif and its size and spacing make for easy reading. The text is completely black-and-white, and figures are presented as either black-and-white or gray-scale images. The quality of some of the figures and flow diagrams could certainly be improved with little effort; some are framed, some are bulleted, and some are presented beneath arrows.

The chapters are organized into 11 sections, the majority of which are based on organs systems. Thus there are sections on "Pulmonary Critical Care," "Renal Critical Care," "Neurologic Critical Care," etc. Additional sections address patient assessment, procedures, pathophysiology, and subspecialty patients. This organization scheme provides a clear structure for the chapters, and one can usually find a subtopic by consulting the table of contents rather than the index. Repetition of certain topics is common in multi-author textbooks, but the editors have done a very good job of limiting the scope of the chapters to narrowly defined subjects. The treatment of pneumonia is well described in the chapter so titled, and that material is not reiterated in the section on infection and immunology. The majority of the chapter authors are anesthesiologists who are recognized experts. Though the perspective of the text does lean toward the anesthesiology brand of critical care, it is not far off center. In most cases the reader will not be able to tell if an anesthesiologist or other specialist wrote a particular chapter.

Key words are presented in a text box at the beginning of each chapter. I found this to be a helpful device that improved the efficiency with which I could read a chapter. Each chapter concludes with a shaded box of "Key Points." Though I think there may be some benefit to this idea, I did not find it very helpful as executed. The Key Points are presented in a narrative format that all too often is a direct restatement of the Summary that immediately precedes the Key Points section. Perhaps a bulleted list would be more distinctive, but I am not sure that these concise chapters need lists of key points. The subject index is easy to use and relatively complete. I found no typographical errors.

I doubt that the addition of the 5 new chapters in this edition would motivate anyone to purchase it. Though they are fine additions to a reference book, only one of the chapters will probably improve the reader's ability to care for the perioperative patient: the chapter entitled "Evidence-Based Medicine," which provides a well reasoned introduction to evidence-based medicine and applies it to clinical examples. A novice can immediately grasp the importance, workings, and limitations of evidence-based medicine in the ICU. In contrast, the chapter "Genomics in Perioperative Critical Care" holds forth a model of genomic-based ICU medicine that is largely speculative at this time. One could just as easily predict that proteonomics will be of greater importance in ICU care, but there is no mention of proteonomics in the book. The chapter "Medical Informatics in the Intensive Care Unit" contains practical information regarding the importance of using information technology. Unfortunately, this chapter relies heavily on descriptions of commercial software products. The typical reader will gain little from this chapter, beyond a lesson in nomenclature and reassurance that ICU information technology is here to stay.

The real strength of this text lies in the chapters that integrate our current understanding of the pathophysiology with the clinical presentation and treatment of the major conditions seen in critical care. In several chapters this is done very efficiently, as in "An Approach to Venous Thromboembolism/Pulmonary Embolism in the Critically Ill." In addition, many chapters offer sound critical evaluations of the literature, in which both the strengths and weaknesses of studies are presented. This is certainly true of the chapter "Acute Lung Injury and Acute Respiratory Distress Syndrome," which does an excellent job of discussing the recent literature in terms of successes and failures. The reference lists have been thoughtfully updated since the previous edition, and when a seminal publication has made a major impact in clinical practice, it is carefully indicated in the text. In certain cases the pace of change in clinical practice has outstripped the author's ability to fully appreciate or predict it. Thus, in the superb chapter, "Management of Life-Threatening Infection in the Intensive Care Unit," Dennis Maki comments on the success of recombinant activated protein C in a clinical trial but did not extrapolate this to today's escalating use of that drug in intensive care.

A relatively short critical care reference text must, of course, make certain concessions, and these will be apparent to the readers of **Critical Care Medicine: a Perioperative Approach**. For example, the space dedicated to the equipment and techniques of mechanical ventilation is relatively limited. Though the chapters present a very well balanced overview, a specialty text is still required to gain a more thorough working knowledge of this subject. The reader might be able to appreciate the meaning of a patient's ventilator settings, but he or she would be ill-advised to go fiddling with the ventilator, even after studying the ventilatory support protocol in the chapter "Basic Principles and New Modes of Mechanical Ventilation." Certain subjects do not lend themselves to new approaches, and so the chapter, "Diagnosis and Management of Ac-

id-Base and Electrolyte Abnormalities," uses clinical examples in a tutorial process. Such a style will either excite or annoy the reader, and this highlights the stylistic inconsistencies common in multiple-author books.

Finally, certain "hot-button" critical care issues are given limited consideration in this text, such as adrenal insufficiency and tight glucose control in the ICU, which are both discussed in the chapter "Care of the Patient With Endocrine Emergencies." The presentation does not capture the importance currently placed on these subjects, perhaps (1) because they do not fit into the idea of perioperative care, (2) because of the chapter structure, or (3) because they were simply not on the "front burner" when the book was being re-imagined. When the third edition is published, we will find out if such topics merit a more complete discussion or if they are simply a passing trend.

Critical Care Medicine: Perioperative Management, 2nd edition, is an efficient and timely tool for introducing and reviewing a wide variety of topics in the care of ICU patients in the perioperative period and other periods. At a cost of $149 it should be within reach of a fellow, resident, or student who is spending a substantial fraction of time in a surgical intensive care setting. Allied health professionals will also benefit from consulting this book, but I doubt that its content will motivate them to purchase their own copies. Perhaps they will be able to find the book on the shelves of surgical ICUs, where it will be a welcome addition.

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Coding Essentials for Respiratory Therapy and Pulmonary Function Testing. St Paul, Minnesota: Medical Learning Incorporated. 2003. Soft cover, 203 pages, $99.

Respiratory schools train therapists for problems of the cardiopulmonary system but not necessarily in the secrets of the ever-changing process of coding and billing for services rendered in the workplace. **Coding Essentials for Respiratory Therapy and Pulmonary Function Testing** was written by the experts at Medical Learning Incorporated to unlock those mysteries in a clearly written text. The company describes itself as "a nationally recognized consulting, publications, and training company that specializes in providing coding, reimbursement, compliance and educational services for hospitals, physicians, and other health care service organizations." This book provides the newest information from the *CPT 2003: Current Procedural Terminology* book from the American Medical Association (AMA). There are also frequent references to specific back issues of the Center for Medicare and Medicaid Service's National Correct Coding Initiative edits, and the AMA's *CPT Assistant* publication. The book has a soft cover and is bound with spiral wire, which may tend to wear with the frequent handling this manual may receive as a reference. There are no illustrations, but there are several charts and an algorithm flowchart that help clarify the material.

The intended audience includes respiratory care managers, pulmonary function laboratory directors, department administrators, and anyone else who needs to deal with coding issues for respiratory care, pulmonary function testing, and blood gas testing. I thought I was well versed in coding issues from my years in the respiratory field, but I learned many things from reading through this handy manual. Mutually exclusive procedures, comprehensive codes, component codes, revenue center codes, payment status indicators, and modifiers are all explained in detail in the beginning of the book. Throughout the book are helpful references and resources, including Web sites and business phone numbers.

Chapter 1 covers Medicare payment methods for respiratory therapy services. Chapter 2 discusses coding and billing for correct reimbursement. Chapter 3 deals with coding and billing strategies for diagnostic testing. Chapter 4 has information on respiratory therapy and various treatments modalities. Chapter 5 covers miscellaneous other services, such as blood gases, sleep studies, and supply, service, and equipment charges.

Chapters 3–6 delve into the specifics of the respiratory care and pulmonary function codes. This is the only weak area of the book; as I read it, I could tell someone not familiar with respiratory care wrote it. If a second edition is released, I would suggest the authors collaborate with respiratory medical personnel to proofread the text.

The chapters are arranged in numerical test code order. In a future edition it would be helpful to add an index for looking up pulmonary function tests and respiratory therapy codes by name instead of number. Typically, each code has a separate page, but if there is extensive discussion, it may go to 2 or 3 pages. Occasionally, when codes are connected and only differ by physician interpretation or test complexity, then 2 or 3 codes may be logically grouped together. Each code or code group has a test description, as worded in the AMA codebook. The proper revenue center codebook is included, followed by a section of one to several paragraphs called "Intended Use of Code." The authors discuss issues that may be of concern for each code. In some sections there are discussions of fiscal intermediaries' and carriers' statements regarding particular codes. Each code has a billing tip section that discusses medical necessity and other tests that cannot be billed on the same day unless a modifier is used. There are discussions of which tests are usually not covered and why. References to the Correct Coding Initiative edits and fiscal intermediaries are provided. Chapter 6 discusses pulmonary rehabilitation services and the Medicare national coverage policy. This chapter will need to be updated soon, because the National Emphysema Treatment Trial results were released at the American Thoracic Society Conference in May 2003 and Medicare is reviewing pulmonary rehabilitation and lung-volume reduction surgery.

The book includes reference appendices that concisely organize needed information. Appendix A has sample Local Medical Review Policies (LMRPs). Appendix B is a 2-page table of CPT codes, Ambulatory Payment Classification (APC) names, and payment rates—a great resource. Appendix C lists the current Medicare guidelines for respiratory therapy.

Specific issues and problems I found in this book were as follows.

• In Chapter 3 (on pulmonary function billing and coding strategy) there is an algorithm on page 22 that is described as a useful guide that may be considered for medical necessity reviews by Medicare fiscal intermediaries and carriers. This algorithm is not referenced, and I believe there are some flaws in it. The major problem I see is that the algorithm would label as "asthmatic" patients who have a normal methacholine challenge test and elevated diffusing capacity for carbon monoxide.

• The section on bronchospasm evaluation (on pages 29 and 30) could be enhanced by adding the code that most laboratories use to bill for the delivery of methacholine