ary niche," as a reference text for medical students, residents, nurses, respiratory therapists, and others with episodic exposure to critical care but with little need, time, or money for the much larger tomes available. Having spent the last few months reading through this book, using it to teach in the intensive care unit (ICU), and loaning it to several residents and fellows, I must agree with the authors' premise and I admire their execution.

By design, **Cardiopulmonary Critical Care** is limited to cover only the physiology and management of respiratory and cardiovascular disorders, with a plan to produce later volumes covering other areas of critical care. Intentionally omitted from this volume are ICU aspects of gastroenterology, endocrinology, infectious diseases (except an excellent chapter on nosocomial pneumonia), and neurology/neurosurgery, among others. This at first might seem a crippling limitation for an ICU reference, but in comparison to unwieldy compendiums that can live only on book shelves (and never on the wards) and the portably encyclopedic but often painfully terse *The ICU Book* by Paul Marino the choice to limit this book's scope was wise and effective.

The book starts with several chapters devoted to respiratory and cardiac physiology, then delves into shock, myocardial infarction, acute respiratory distress syndrome, pulmonary embolism, and acid/base disorders, and then broader subjects such as postoperative care in the ICU. Importantly, several chapters address technical aspects of ICU care, such as mechanical ventilation (including lung-protective strategies, weaning, and noninvasive positive-pressure ventilation), vascular access, and hemodynamic monitoring, as well as fluid resuscitation and pressors. Coverage of each subject is generally quite thorough and occasionally even a bit too detailed for use as an easy reference. Fortunately, this over-exuberance is largely confined to the chapters on basic physiology.

In assessing this book overall, a natural point for comparison is the above cited, less current (1998) book by Marino, which targets much the same audience. The strength of Marino's book is its completeness, which often comes at the expense of readability. **Cardiopulmonary Critical Care** takes the opposite approach. I found many of the chapters of this book not only informative but actually enjoyable reading.

Much like Marino's book, **Cardiopulmonary Critical Care** is written at a level accessible to those encountering the ICU for the first time and organized in a fashion that allows those well-versed in critical care to easily focus on individual topics of interest. The authors' approach to each subject is strongly evidence-based, though (fortunately) with an appropriately reductionist view, yielding quick and meaningful interpretation of the literature. For example, the chapters on myocardial infarction, acute respiratory distress syndrome, and nosocomial pneumonia serve equally well as cohesive introductions to these subjects for students and as quick best-practice reviews for those already familiar with the topics.

The chapters on technical aspects of ICU management are outstanding. Subjects such as ventilator management, fluid resuscitation, and hemodynamic monitoring are cogently explained. The chapter on vascular access, though a bit wordy, is the best I've read and presents a series of excellent photographs detailing the relevant anatomy of vascular access.

Given the book's intended portability, its hard cover is a bit odd, and, as one resident remarked, its orange and green cover design looks a lot like an eighth grade math text. Outward appearances notwithstanding, the text is well illustrated, with fairly simple diagrams and tables that allow ready understanding of the material. The text is well (and relevantly) referenced, and the index is quite useful. There are very few typographical errors.

Though **Cardiopulmonary Critical Care** will not satisfy the hardboiled intensivist with sweeping scope and minute detail, it admirably accomplishes that which it sets out to do. It is an excellent resource for respiratory therapists, nurses, residents, and others who seek a thorough yet readable (and portable) reference text for their ICU work and is a strong alternative to *The ICU Book* for the subjects covered. I look forward to reading the planned companion volumes, which will cover other aspects of critical care medicine.

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Tissue Oxygenation in Acute Medicine. William J Sibbald MD, Konrad FW Messmer MD, and Mitchell P Fink MD, editors. (Update in Intensive Care Medicine, Volume 33, Jean-Louis Vincent MD PhD, series editor). Berlin Heidelberg: Springer-Verlag. 2002. Soft cover, illustrated, 378 pages, $49.95.

This book is part of the prestigious series of monograms, "Update in Intensive Care Medicine," edited by Jean-Louis Vincent. The book is a collaborative effort of an international group of experts in the field of oxygen transport and tissue oxygenation. Its 24 chapters are grouped into 4 sections: "Physiology of Oxygen Delivery," "Hypoxia and Its Consequences," "Measuring Tissue Oxygenation," and "Blood and Blood Substitutes as Oxygen Carriers." Although there is variability of style among the contributors, the editors have compiled an impressive collection of complementary essays regarding this very important subject.

The first section addresses the basic mechanisms of heart-lung interaction and the effect of changes in intrathoracic pressure on venous return, left ventricular function, and cardiac output. Spontaneous inspiratory efforts decrease intrathoracic pressure, in particular during airflow obstruction, at times resulting in right ventricular overdistention and changes in left ventricular afterload. The concept that blood flow is not distributed equally among organs or even within tissues is also explored in this section. New mathematical modeling techniques, which use fractal analysis, provide the framework of new concepts in tissue blood flow heterogeneity, whereas metabolic indicators of oxidative metabolism can be used to determine the adequacy of cellular oxygen availability in relation to the metabolic requirements of the tissues. These metabolic markers include tricarboxylic acid cycle enzyme activity, the products of adenosine 5′-triphosphate (ATP) breakdown, such as inosine, and measurement of ^{13}C-enriched glutamate with nuclear magnetic resonance.

Perhaps the least understood component of the oxygen transport cascade is the microvasculature, that vast array of microscopic vessels through which the red blood cells course as they release oxygen from hemoglobin. This section has a particularly lucid discussion on the relationship of tissue oxygen delivery, microcirculatory phenomena, and the local regulation of cellular 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

Lecture # 4 General medicine Faculty. Pathology of blood circulation. (Edema, hyperemia, ischemia, hemorrhageÂ 1. Edema - accumulation of tissue fluid in serous cavities, or stroma of organs. Mechanisms of formation. In the thoracic duct and eventually into the left subclavian vein. 1 - Increased hydrostatic pressure in capillaries; 2 - Low osmotic pressure of plasma; 3 - Sodium and water retention; 4 - Lymphatic obstruction; 5 - Increased permeability of the vascular wall.Â Due to hypoxia and increased hydrostatic pressure, capillary permeability rises acute, plasma steepness and edema, stasis in capillaries and multiple diapedemic hemorrhages develops in the stroma of the organs; in the parenchyma - dystrophic and necrotic changes. Left ventricle. Right ventricle. Japanese Association for Acute Medicine. May 2020. ^ ç–«æƒ…å…³é”®æ—¶åˆ»æ•‘å‘½çš„ECMO:å…¨å›½åªæœ‰400å° ä¸ºä½•è¿™ä¹ˆå°‘ï¼Ÿ (in Chinese).Â "Intestinal epithelial apoptosis initiates gut mucosal injury during extracorporeal membrane oxygenation in the newborn piglet". Lab. Invest. Bias of Tissue Oxygen Saturation. Tissue oxygenation cannot be compared directly with any other measurement because it represents the findings in a mixture of blood in the arteries, capillaries, and veins. Interestingly, though, StO2 has been validated on the head of young infants with heart disease during cardiac catheterization.35 In this study, across an StO2 range of 40% to 80%, the mean value was almost identical to oxygen saturation in jugular venous blood as measured by co-oximetry.Â Tissue oxygenation: Factors important in the process include blood oxygen content, delivery of oxygen to tissues, and consumption of oxygen by tissues. a.Â Examples include acute respiratory distress syndrome, pneumonia, and pulmonary embolism. c. What causes impaired tissue oxygenation in lactic acidosis? Previous. References.Â Shapiro NI, Arnold R, Sherwin R, O'Connor J, Najarro G, Singh S. The association of near-infrared spectroscopy-derived tissue oxygenation measurements with sepsis syndromes, organ dysfunction and mortality in emergency department patients with sepsis. Crit Care. 2011. 15(5):R223.