

icine over the past 15 years. Perhaps, one of the most important advances in our ability to provide safe and effective care for patients suffering from critical illness and diseases of the chest is the addition of ultrasound guidance. Ultrasound imaging can provide a noninvasive look into body structures that we are not normally able to visualize with the naked eye or by using a video bronchoscope. It can also provide a window into the structure and function of organs such as the heart, the size and location of abnormal lesions such as enlarged mediastinal lymph nodes, and can provide us with the ability to extend our diagnostic and therapeutic armamentarium to places that we have previously either accessed blindly or not at all.

The previous generation of pulmonologists and respiratory therapists would be stunned at the rapidity with which the use of ultrasound has gained traction in clinical practice. For example, blind thoracentesis was performed on a routine basis at our teaching hospital just 7 years ago. For the past 5 years there has not been a single thoracentesis performed without ultrasound guidance. The result has been a dramatic decrease in the rate of pneumothorax, to the point where it is negligible, and ultrasound has provided us with the ability to distinguish between uncomplicated and complicated pleural effusions, the latter of which may require chest-tube drainage. In addition to thoracentesis, ultrasound is now routinely used in the intensive care unit to guide catheter placement for central venous access—again with a decreased incidence of untoward events. Perhaps the biggest technologic advance in bronchoscopy since the introduction of the flexible bronchoscope in the 1970s is the addition of ultrasound. The increasingly routine use of endobronchial ultrasound with fine-needle aspiration has revolutionized the way in which we diagnose the stage of lung cancer.

Thus the release of the reference text entitled, **Clinical Chest Ultrasound: From the ICU to the Bronchoscopy Suite** is both timely and welcomed by the respiratory community. The book is separated into sections: the basics; thoracic ultrasound; critical care applications; endoscopic applications; and ultrasound for therapeutic procedures. Each of these sections is subdivided by chapters specific to that heading. I find these distinctions helpful because they allow readers to quickly

find the chapter most related to their clinical problem as well as to read other associated chapters within a given section. There are several other important strengths of this book. The first is the comprehensive nature of the work. The authors provide terrific anatomic detail within each subject heading. This is generally followed by a detailed “How To” section. Some chapters discuss the necessary training required to gain competency in these procedures. A reasonably good literature review is provided regarding the diagnostic accuracy of the procedure and in the cases of advanced diagnostics and therapeutics, and an adverse events profile is discussed. The issue of improved safety with ultrasound guidance of thoracic structures such as the lung and vasculature is appropriately emphasized time and again.

Another impressive aspect of this book is that the editors were able to assemble a who’s who of writers for each chapter, all of whom are recognized international experts in their respective fields. They not only do a terrific job of explaining each technique, they also have vast clinical experience and often point out small but important caveats, which will improve the reader’s ability to utilize this technology to its highest potential.

Because ultrasound is such a visually based skill, much weight must be placed on the figures and illustrations. The authors paid careful attention to that detail in the book and include 214 figures within the text to emphasize anatomic detail and to distinguish normal from diseased structures where appropriate. Further, there is online supplementary material, which includes video clips of specific procedures. For those who do not have a great deal of experience in performing these procedures the video clips will be an invaluable tool.

There are very few drawbacks to this book. Because of the usual time delays between writing and publication, and because this is a new field with much added to the peer-reviewed literature in a short time frame, the reference lists in some chapters are incomplete. This is only a slight critique though, and can be overcome with a simple computerized library search.

In summary, this is an excellent reference text, which is both scientifically strong and of great practical use for clinicians who perform procedures in the intensive care unit and bronchoscopy laboratory. It is a must-read for trainees and a terrific read for those

out in practice who want to keep pace with technological advances in the clinical arena.

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Chemistry and Physics for Nurse Anesthesia: A Student Centered Approach.

David Shubert PhD and John Leyba PhD.
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For many years, educators in the allied health sciences have been challenged to provide courses in mathematics, chemistry, and physics that provide support for clinical curricula in respiratory care, nursing, and nurse anesthesia. Because of the compact time frame, community colleges frequently offer generic mathematics classes and a blended “science” course. Four-year colleges and universities typically offer a series of mathematics courses (pre-algebra through calculus), 2-semester courses for both general chemistry and organic or biochemistry, and physics courses are frequently either elementary or linked toward graduate level.

Regardless of the pre-professional preparation, many students entering programs of respiratory care and nurse anesthesia possess a marginal background in the physical sciences. In addition, mathematics skills are often incomplete. Therefore, many programs are forced to incorporate applications of chemistry and physics in their pre-clinical and clinical-based classes with attention to upgrading mathematics abilities.

In the past there have been textbooks that were specifically designed for either allied health science students or with a specific focus toward respiratory care and anesthesia. However, these texts no longer remain in print. An alternative approach has been to incorporate chapters in applied chemistry and physics as part of comprehensive textbooks on clinical care. This was done for early textbooks in inhalation therapy, and the theme has continued, especially in books on equipment.

In the preface, authors Shubert and Leyba echo the frustrations of those who have experience teaching students who are “almost universally uncomfortable with chemistry and absolutely terrified with physics.” We suspect this provided the motivation to write a book targeted to nurse anesthesia but that appears equally appropriate for respiratory therapy education. Overall, the book is an enjoyable read, with occasional humor interjected to help lighten up the material. Additionally, each chapter contains practice questions, which are generally clinically focused to help the student self-test important concepts; the answers are included at the end of the book.

This 13-chapter book begins with a chapter on measurement. The authors review the order of mathematical operations, linear algebra, exponents, and scientific notation. Measurement is described in terms of accuracy and precision, and basic units of measurement in the metric system and the *Système Internationale* (SI). Conversion of units is very brief; there is no conversion of metric units less than a centimeter. Descriptive statistics are also not addressed. The final section begins the discussion of chemistry/physics with a review of density and specific gravity.

Chapter 2 provides a review of the periodic table, nomenclature, and both atomic and molecular structure. Although these topics are not directly applicable to clinical anesthesia and respiratory care, they serve as the critical foundation to help students understand other chemistry topics addressed in this book, as well as provide a framework for clinical pharmacology. The “mole” is introduced in this chapter but probably not discussed to the extent that would allow a thorough understanding of this concept, which is critical to help the student fully grasp stoichiometry and concentrations of solutes and electrolytes.

Chapters 3 and 4 review the “meat and potatoes” of physics. Kinematics and an introduction to hydrostatics is provided, with applications, including the barometer, Bourdon gauge, and fluid manometer. Two-color illustrations are provided. Typically after review of force and pressure some mention of elastance and/or compliance is included, starting with Hooke’s law. The missed application of the pressure versus volume relationship seems an

important omission for respiratory therapists or nurse anesthetists, who ventilate lungs and deal with non-compliant or overly compliant systems.

Chapter 5 continues with more detail on hydrostatics and then moves into hydrodynamics. Although Bernoulli’s theorem and the Venturi tube are illustrated and derived mathematically, there is no discussion of their important clinical applications. The authors, unfortunately, use the redundant term “flow rate” (instead of flow) throughout the chapter. There are no mentions of either background physics or clinical importance of the Hagen-Poiseuille law/equation, flow through orifices, or the Reynolds number. Difference between laminar and turbulent flow are briefly mentioned but not quantified, and diagrams are not provided.

Chapter 6 covers the gas laws, including Dalton’s, Boyle’s, Charles’s, the ideal, and the combined gas laws. The authors do a fine job of applying Dalton’s law, showing the effect of water vapor when calculating oxygen (gas) partial pressure on room air. However they appear to miss an important point of going the next step in calculating the effect of altitude and higher concentrations of oxygen and carbon dioxide on alveolar oxygen partial pressure (P_{AO_2}). The application of hyperbaric changes on lung volume (eg, in scuba diver ascent) is provided. The use of the combined gas equation to correct pulmonary-function-test gas volumes from ambient-temperature-and-pressure-saturated (ATPS) to body-temperature-and-pressure-saturated (BTPS) conditions is not included.

Chapters 7–9 address the core concepts of inorganic and physical chemistry relevant to respiratory care and anesthesia. In Chapter 7, chemical bonding and properties of molecular and ionic compounds are appropriately addressed. The authors identify the importance of intermolecular forces and their role in defining physical properties of compounds, and clearly develop this concept. Vapor pressure of liquids is discussed; however, given the importance of this concept to the use of volatile anesthetic agents, the authors use a paucity of clinical examples to illustrate this concept. Further, critical temperature and pressure is a core concept important to the understanding of the properties of compressed gases, but only 3 sentences are devoted to this topic. There is a long

discussion of supercritical fluids, which has nothing to do with human physiology or anesthesia.

Chapter 8 provides an excellent review of solutions. The authors use real and appropriate clinical examples to illustrate concentrations, although they fail to address dilution, a critical concept in dealing with concentrations of drugs and other substances in clinical anesthesia. Many allied-health-focused chemistry textbooks fail to address the old, but still commonly used, topic of equivalents; however, Shubert and Leyba clearly and concisely develop this very complicated topic.

Chemical equilibrium, acids, bases, and buffers are discussed in Chapter 9. These topics are usually the bane of students studying chemistry; however, the authors address them in an eloquent manner. Given that many drugs have acid/base properties, the authors could have included some more clinically relevant examples, which may have reinforced concepts such as the effect of pH on drug ionization and the Henderson-Hasselbalch equation, as this concept is often addressed on the board certification exam for nurse anesthetists. Although the Henderson-Hasselbalch equation is introduced on page 249, the discussion of this topic may not provide the level of understanding required of nurse anesthesia or respiratory care students. It would seem that at least end-of-chapter examples of hyperventilation and hypoventilation and metabolic acidosis could bridge clinical application of acid-base balance principles.

The understanding of the basic concepts of organic and biochemistry are crucial to thoroughly appreciate clinical pharmacology and drug metabolism. Chapters 11 and 12 address the fundamentals of organic and biochemistry. The major organic functional groups, classes of biochemical compounds, and stereochemistry are reviewed. As appropriate, properties of organic functional groups are emphasized, providing students with a concrete foundation for a better understanding of pharmacology. Memorizing hundreds of organic reactions is common for many college students learning organic chemistry; however, Shubert and Leyba discuss reactions that are generally only relevant to drug metabolism. Although the authors provide many examples of compounds containing functional groups, few

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of these examples were derived from clinical pharmacology.

The authors address nuclear chemistry in the final chapter. Although this topic is interesting, and a brief and concise summary is provided, nuclear chemistry has little applicability to either respiratory therapy or anesthesia.

Overall, this text by Shubert and Leyba definitely fulfills a need for a textbook that provides a foundation for the basic physical sciences for students of nurse anesthesia and respiratory therapy. To our knowledge there are no other similar books in print for respiratory care or nurse anesthesia programs.

The text offers a concise and clear foundation for students; however, many of the scientific examples were not applicable to clinical practice. Additionally, the authors occasionally inject humor, making this textbook easy to read. Upon request the publisher will provide rudimentary text-based slides to programs that purchase the text; these may serve to provide instructors with a framework from which they can organize formal PowerPoint lectures.

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