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Book reviews

Pulse Oximetry, 2nd ed., by JTB Moyle
(BMJ, London, UK, 2002. 174 pp. £19.95. ISBN 0-7279-1740-4)

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This book is written by an engineer who works in clinical settings. The first 60 pages are devoted to the technical description of pulse oximetry (PO). The author not only describes the basic principles and structures of the instrument, but he also discusses its various inherent problems: factors that make it deviate from the Beer-Lambert law, why the 940-nm wavelength was chosen originally and why other bands are now being chosen, efforts to reduce noise both in electronic circuitry and in the logic/algorithm of calculation, the problem of battery operation, reflection-type PO, the problem of calibration both in vivo and in vitro (Chapter 4), and various aspects of photo plethysmography (Chapter 5). Most of these discussions are of high quality and are very informative, particularly for readers with an interest in the engineering aspect of this instrument.

There is an argument in one section about which this reviewer felt dubious. In attempting to explain why pulsation affects light absorption, the author points out that it is not the distensibility of the pulsating blood vessels that makes more red cells available to absorb light during systole; rather, it is the directional change of red cells facing blood flow during systole that makes more hemoglobin to absorb the light. This idea is interesting, but it is hard to believe for two reasons. First, the author fails to explain why distensibility can be ignored. Second, if the red cells face the flow, the light may have to pass a longer distance in a single cell; however, there are then more "holes" between the cells for the light to go through without being absorbed by hemoglobin. Unless I find satisfactory explanations for such observations, I am hesitant to accept the author's arguments.

The parts of this book concerning physiological and clinical problems are less attractive because they are already known to physicians and are addressed in various books and/or review articles. For example, chapter 6 (oxygen transport) contains no special information. In Chapters 8, 9, and 10, the author discusses various clinical problems. He chooses to include as many fields as he can, rather than to concentrate on specific areas. Subsequently, this book touches on the problems in just about every medical field imaginable. This breadth may be disappointing for someone in anesthesia, for instance, who expects specific information related to anesthesia or to intensive medicine to be extensively discussed.

This reviewer found the second half of Chapter 7 (PO at high altitude), beginning at page 71 under "Flying at high altitude," to be quite intriguing. There the author discusses hypoxemia, which may be encountered during commercial flight. This subject is of practical importance, but it is rarely discussed as well or to the degree found in this book. There is one small problem, however. The author assumes the cabin pressure is equivalent to 8000 ft (2600 m, 549 mmHg), which is close to the limit of airline regulations (2/3 atm). It is my understanding that every airline company attempts to maintain a pressure of 5000 ft (1640 m, 620 mmHg). Therefore, hypoxemia may not be as severe as described in the text. Yet it is significant, and the author's arguments are still qualitatively valid.

In Chapter 11, the author discusses the effect of abnormal hemoglobin, such as carboxyhemoglobin and methemoglobin, on PO. This type of discussion is rare in a book of this nature and is quite useful, although similar discussions may be found in various review articles.

In summary, I found this small book to be interesting and informative, especially about the engineering aspects of pulse oximetry. I recommend it to those who share similar interests.

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