REVIEWS OF EDUCATIONAL MATERIAL

James C. Eisenach, M.D., Editor

Mathematics and Statistics in Anaesthesia. By Steven Cruickshank. New York, Oxford University Press, 1998. Pages: 258. Price: $24.95.

When reading a manuscript, do you routinely skip over equations in the text as though they were written in a foreign language? When you come to the description of the statistical methods, do you mentally say "yadayadayada?" Are you an anesthesiologist? If the answers to these three questions are yes, then Steven Cruickshank has written a text that should be on your "must read" list.

Mathematics and Statistics in Anaesthesia is a remarkable book. First, the title is wrong. Mathematics and statistics are the second and third chapters, respectively. The first chapter is about physiologic and pharmacologic modeling. Only after explaining many of the models that we use in the practice of anesthesia does Dr. Cruickshank undertake a comprehensive review of mathematics and statistics. Second, the book covers the topics using examples familiar to anesthesiologists: changes in arterial carbon dioxide partial pressure with ventilation, thermodilution measurement of cardiac output, distribution of drugs into body tissues, and the probability of passing anesthesia board examinations. Those who have read textbooks that explain the statistics of predicting next year's corn harvest will appreciate Dr. Cruickshank's efforts to describe basic concepts with familiar examples from anesthesia. In fact, we are incredibly fortunate to have an anesthesiologist willing to write a textbook on modeling, mathematics, and statistics just for our small clinical community.

The first chapter covers the essential concepts well known to those of us who do modeling for a living. Dr. Cruickshank communicates the fundamental concepts of model building and testing, including the trade-off between empiric models and mechanistically based models, and the balance between system complexity and mathematically tractability. The "fluxoid" concept provides a novel (at least to me) and intuitive method of interpreting physiologic models. He is also appropriately skeptical of models, emphasizing that they need to be continually tested against the physiology they are trying to explain.

My only complaint about the modeling section is that Dr. Cruickshank goes out of his way to avoid using calculus. Calculus was invented to simplify the solving of mathematic models. It does this superbly. I had difficulty following some of his noncalculus derivations, mostly because the derivations using calculus are essentially instantaneous. In a future edition I would hope that Dr. Cruickshank would place the mathematics chapter first and then feel free to use calculus in building and manipulating his models.

In a mere 60 pages, the chapter on mathematics covers fundamental concepts ranging from basic functions and trigonometry to first-semester calculus and numeric methods. Although it is an excellent review, it is so condensed that it might be challenging for individuals who had never studied these topics in school. The highlight of the text for me was the statistics chapter. Rather than start off with various tests and *P* values, Dr. Cruickshank approaches statistics by presenting the characteristics of distributions. Although this may sound foreign, it is actually a wonderfully intuitive approach to the topic. Only after explaining the different distributions does Dr. Cruickshank explain how these distributions are used to draw statistical inference. I read this chapter with an open spreadsheet on my computer, testing out each distribution as he described it. The chapter brought me new insights into fundamental statistics.

I have several suggestions to anesthesiologists who wish to understand quantitatively the physiology and pharmacology they see clinically every day, or wish to understand intellectually the mathematics and statistics that fill their journals. First, buy the book. At approximately $25, it is a bargain. Second, take your time. You may be able to understand a manuscript if you skip over the math and statistics, but you certainly will not understand this book if you refuse to read the equations. It would seem reasonable to spend an entire evening on each of the models in the first chapter, pondering it, analyzing it, plugging numbers into it to see if the results make sense, and manipulating the equations to see what other insights can be developed. This is what people who make models do. They spend hours, weeks, or even a lifetime trying to understand the implications of simple models. Similarly, the chapters on math and statistics cover so much ground in so few pages that they should be read slowly—just four or five pages a day. Third, buy a magnifying glass. I struggled to read the impossibly small type. Finally, be prepared to laugh. Dr. Cruickshank has an excellent sense of humor, which shows up repeatedly in the text.

In summary, this book is a great New Year's resolution. If you are tired of not understanding modeling, mathematics, and statistics, then make a resolution for the year 2000 that you will spend a few minutes each day with *Mathematics and Statistics in Anaesthesia.* By August 2000, you should be able to amaze your residents, startle your professors, understand your journals, and be able to turn even the most routine anesthetic into a quantitative physiologic experiment.

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Clinical Anesthesia Procedures of the Massachusetts General Hospital. William E. Hurford, Michael T. Bailin, J. Kenneth Davison, Kenneth L. Haspel, and Carl Rosow. Philadelphia, Lippincott-Raven Publishing, 1997. Pages: 816. Price: $34.95.

Clinical Anesthesia Procedures of the Massachusetts General Hospital is now in its fifth edition. Those familiar with the earlier editions will find little change in the format or style in this new one, which includes 94 additional pages. Much of this derives from the use of a different typeset, but part of it also comes from chapter revisions. The reader might think after thumbing through the first few chapters that few changes have been made, and thus the newer edition does not warrant the $34.95 purchase price. But this would be wrong. It is new and improved. The handbook has been updated to cover newer drugs. Examples include those used to treat hypertension and diabetes and the agents used during operation by anesthetists, such as remifentanyl, milrinone, and ropivacaine. Most of the chapters have been revised extensively. If the reader was pleased with the previous edition, this new edition will not fail to please.

No review, however, would be complete without criticisms, as they might provide the basis for an improved sixth edition. The former typeset allowed fewer pages with no difference in the reading comfort. After all, what good is a handbook that is too large for the hand. There is no listing for *latex* in the index, nor will the reader find the word under the chapter that addresses allergies (Chapter 1). There should be twice as many drugs listed in the appendix and in half the space. Also missing are such items as the toxic dose of ropivacaine.

Of the many handbooks on the market, this is the best-selling, and for good reason: It provides a quick reference that is concise and accurate for most issues encountered in clinical anesthesia.

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