BOOK REVIEWS

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Studying a Study and Testing a Test: How to Read the Medical Literature. Second Edition. BY RICHARD K. RIEGELMAN AND ROBERT P. HIRSCH. Boston, Little, Brown and Company, 1989. Pages: 349. Price: $25.00.

How does "odds ratio" differ from "relative risk?" How is the sensitivity of a clinical test related to its positive predictive value? Riegelman and Hirsch provide clear, concise answers to these and countless other questions of study design, analysis, and interpretation in this clearly written textbook.

The text is divided into four sections, each of which is arranged in a similar, logical fashion. Part I, "Studying a Study," begins by presenting the results of a hypothetical clinical study along with a set of "conclusions." The reader is then challenged to answer a series of questions regarding the design of the study and the validity of the conclusions. Subsequent chapters systematically address these issues, by focusing on four key areas: assignment of patients to study groups (pro- or retrospectively), assessment of treatment outcome, analysis of data, and interpretation of the results. Statistical principles are discussed on an intuitive rather than mathematical basis; the problem of multiple comparisons and the need to decrease individual *P* values appropriately is thoroughly addressed (although Bonferroni's name is never invoked!). In discussing interpretation of study results, the authors address the issue of association *versus* causation and extrapolation of study data to individuals and at-risk populations, as well as the concept of clinical importance *vis a vis* statistical significance. Having read Part I, one is ready to tackle the "flaw-catching exercises" that serve as an "interactive summary" of the material: several hypothetical studies (including case-control, cohort, and randomized designs) are presented; after reviewing each example, one can compare one's critiques with those of the authors.

Part II, "Testing a Test," discusses the factors that must be considered in interpreting laboratory data, both clinically and in research. First, the authors establish that the diagnostic utility of a test depends on the intrinsic variability of the test procedure, as well as intersubject variability among patients with and without the disease in question. The authors then address the importance of appropriately defining the term "normal"; the distinction between normal and "ideal" values for tests of serum cholesterol and intraocular pressure is used as an example. Hypothetical examples clarify the interrelationships between the sensitivity and specificity of a test and the positive and negative predictive value of that test. A series of flaw-catching exercises completes Part II: in this case, the examples illustrate principles such as the development of appropriate normal ranges, and factors contributing to (and detracting from) the diagnostic discrimination of hypothetical tests.

Part III, "Rating a Rate," discusses the design and interpretation of studies dealing with the natural history of disease; therefore, the authors begin by carefully defining incidence rate, prevalence, and case fatality rate. Methods for sampling and standardization are discussed, along with the advantages and disadvantages of stratified random sampling and of standardized mortality ratios. Possible explanations for changes in disease incidence and fatality are explored: these include cyclical variation in disease, regression to the mean, psychological regression, and cohort effects. Once again, a series of flaw-catching exercises completes Part III.

Part IV, "Selecting a Statistic," begins by presenting basic principles of statistical estimation and inference; the appropriate applications of the standard error and standard deviation are clearly described. After defining the hierarchy of different classes of variables (continuous, ordinal, and nominal), the authors discuss how rescaling variables to a "lower" class (*e.g.*, transforming a continuous variable into an ordinal variable), though statistically valid, decreases the available information and increases the likelihood of type II errors. The next chapter describes statistical methods appropriate when there is no independent variable and a single dependent variable—"univariable analysis"; applicable methods, including paired Student *t*, Wilcoxon and sign tests, are described in intuitive, nonmathematical terms. The authors emphasize the central limit theorem, which states that "even if population data do not have a Gaussian distribution, a large series of means obtained by repeated random sampling of the same population will eventually have a Gaussian distribution." Bivariable analysis, including Student *t*, linear regression, correlation, Mann-Whitney, Spearman rank correlation, chi-square, Fisher's exact, and McNemar's tests form the subject of the following chapter; pitfalls associated with interpretation of regression and correlation results are thoroughly described. The penultimate chapter deals with multivariable analysis; after a reasonably thorough overview of repeated measures and factorial analysis of variance, the authors briefly describe the applications of *post hoc* testing, citing the Student-Newman-Keuls test as an example. Multiple regression is presented next, with analysis of covariance presented as a cross between analysis of variance and multiple regression. After a brief discussion of the Kruskal-Wallis and Friedman tests for ordinal dependent variables, the authors conclude by briefly describing multivariate techniques for nominal variables including life table analysis, discriminant analysis, and logistic regression. Unlike the previous sections, Part IV is not summarized by flaw-catching exercises. Rather, it consists of a "master flowchart," which enables one to choose appropriate statistical tests based on the characteristics of the independent and dependent variables; this helps to put the various procedures in perspective and is helpful in guiding the reader to the appropriate sections of conventional statistics texts or computer programs.

Riegelman and Hirsch have done a wonderful job in presenting diverse, complex topics in an informative, thought-provoking way. The flaw-catching exercises provide an opportunity to assess one's understanding of the material presented in the preceding chapters. Having completed these exercises, one can easily answer the questions raised at the beginning of this review: the odds ratio is applicable to both cohort and case-control studies, whereas relative risk is applicable only to cohort studies; the positive predictive value of a test depends on both its sensitivity and on the prevalence of disease in the population.

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Basic Physics and Measurement in Anaesthesia. Third Edition. BY G. D. PARBROOK, P. D. DAVIS, AND E. O. PARBROOK. Oxford, England, Butterworth-Heinemann, 1990. Pages: 344. Price: $49.95.

Basic Physics and Measurement in Anaesthesia is one of several books explaining physical principles used in the practice of anesthesia. Although physics is usually tedious and theoretical, this book emphasizes practical clinical situations and explains in simple terms their physical and chemical foundations.

The book is divided into 25 chapters, an appendix explaining the various units of measurement, and a thorough index. The chapters are organized by physical and chemical topics, starting with basic physical concepts, such as force, pressure and the gas laws, and progresses into more complex, clinical topics, such as blood pressure measurement, vaporizers, and mass spectrometry. The chapters begin with basic con-