Campbell MJ, Machin D. Medical statistics: A commonsense approach. 3rd edition. Chichester: John Wiley & Sons Ltd; 1999. 203 pages; ISBN 0-471-98721-2; price: US$34.95

If you carefully read the back cover of the "Medical statistics: a commonsense approach" you will be surprised to learn that it was "designed for medical students and nurses". Although it might be so, I'm sure that not only a young physician or resident, but an experienced researcher as well, will find a few pieces of advice in it.

The authors of the "Medical statistics: a commonsense approach" are two statisticians: Michael J. Campbell from the School of Health and Related Research, University of Sheffield, UK, and David Machin from NMRC, Clinical Trials and Epidemiology Research Unit, Singapore. The book is divided in 10 chapters, accompanied by 2 appendices and a list of statistical tables.

The first chapter deals with the "Uses and Abuses of Medical Statistics". The authors explain the importance of statistics in biomedical research. Then, they give the examples of several different ways in which medical statistics might help: sample size and power calculations, questionnaires, choice of sample and control subjects, study design, data display, and choice of summary statistics and statistical analysis.

The second chapter deals with the basics of every good clinical research – "Design". The chapter explains the enormous importance of defining the objectives of a study first, before actually starting with the study itself. After that, various types of clinical studies are discussed in detail, including their advantages and limitations. It is worth mentioning that methodological studies are also reviewed – reference ranges, method comparison studies, and studies of diagnostic tests. Controlled trials in single subjects, dose-response studies, and mixed studies are briefly mentioned. The questionnaire and form design, seldom found in biomedical statistical manuals, has been explained in detail. The most important advice to those planning a questionnaire is look for an already existing one and use it, because making a good questionnaire is a time consuming and labor-intensive job. The last few sections of the chapter are dedicated to the methods of randomization and give practical tips on different randomization protocols.

"Probability and Decision Making" is the title of the third chapter. The authors illustrate the concept of probability in the context of clinical tests. Two major parameters of diagnostic tests – sensitivity and specificity, are discussed in detail. Bayes' theorem, which allows *prior* assessments about the chances of a diagnosis to be combined with the test result in order to obtain *a posteriori* assessment, is illustrated in the context of a predictive value of a test and a likelihood ratio. Relative (or receiver) operating characteristic curves (ROC curves), valuable tools for decisions on cut-off points in diagnostic tests, are also discussed.

Statistical methods are most frequently used to summarize or, in other words, describe data. "Data Description" is the subject of the fourth chapter. First the authors define qualitative and quantitative data, and scales of measurement. The section on the categorical data is particularly interesting. The authors discourage the use of pie charts for summarizing categorical data, since the human eye is not very good at comparing angles. In addition, the chapter describes different statistical approaches to summarizing categorical data, particularly useful in epidemiological and clinical studies: absolute and relative risk reduction, and number needed to treat (expect to number of people to treat in each group for every person to benefit the test treatment). Another interesting and useful topic of this chapter is within-subject variability, i.e., variability of measurements made repeatedly on one subject.

In the first couple of paragraphs of the fifth chapter, "From Sample to Population", the authors introduce the terms population, parameters, and sample. Then, they describe the well-known normal distribution, as well as two other distributions: binomial distribution and Poisson distribution. The latter two sections, although short, are not only straightforward and easy to understand, but are also illustrated with simple and practical examples from clinical research.

Chapter six, "Statistical Inference", begins with the description of the null hypothesis and introduces the p-value. Three common statistical tests are described: Student's t-test, the chi-squared test,

and Fisher's exact test. The statistical power and non-parametric tests are mentioned as well. Although greater statistical power makes parametric tests more popular than the non-parametric, the use of a non-parametric test is sometimes unavoidable. Therefore, the section on non-parametric statistics should have been more detailed.

Statistical techniques used for dealing with relationships between variables are the subject of the seventh chapter. If we have in mind that the substantial part of published research include correlation or regression analyses (1), it is a very good idea to pay so much attention to their description. Their advantages and limitations are explained in detail, as well as assumptions and possible problems (and solutions!) one might have performing them.

Chapter eight is dedicated to a single type of study: "The Randomized Controlled Trial", widely recognized as the most valuable clinical study (2) (hence one study for the chapter). The chapter highlights two features of the randomized controlled trial: design and protocol. The investigator planning her/his trial will certainly appreciate guidelines for writing a protocol of the randomized controlled trial as well as the checklists for the design, analysis and reporting of trials.

Chapter nine deals with "Designed Observational Studies", particularly with two main types of those studies: the cohort study and the case-control study. The chapter is actually focused on different summary statistics used to describe the outcomes of those studies.

Chapter ten, "Common Pitfalls in Medical Statistics" is my favorite. Although, virtually all biostatistical manuals point out some mistakes as frequent in statistical analysis, different misuses of statistics can be found even in manuscripts published in very fine journals. Among other common mistakes, the authors deal with the use of correlation to compare two, usually diagnostic, protocols. Since that comparison is inappropriate for a number of reasons, an alternative approach is given – scatter diagram of difference between methods against mean of both. It is both efficient and easy to perform. Another pitfall based on correlation analysis, but seldom explained in other books is plotting the change against the initial value. Again the authors offer a simple solution – regression to the mean. Problem of repeated measures, common in clinical practice, is discussed in detail, including both the invalid and valid approaches.

Appendix I contains a brief overview of calculations of almost 30 most frequently used statistical tests and parameters. Although it may be handy to have different computations in one book, the inexperienced reader will probably find some of them difficult to follow. However, I am not aware of anyone who performs statistics "manually" these days. Moreover, the authors recommend the use of commercial software packages, in order to avoid arithmetical mistakes.

If you want to test your knowledge and understanding of statistics, there is a list of multiple choice questions in Appendix II. Fortunately, unlike most books, the authors have provided not only the answers, but explanations as well. The list of statistical tables is rather short, including only 5.

A feature very useful for a "novice" in medical statistics and medical research is that all the chapters are accompanied with guidelines for evaluation of statistical methods in the literature. In addition, the book contains an excellent list of references.

Although the book is entitled "Medical Statistics", it certainly is not a classic statistical manual. The authors state that "The design of studies is often not given sufficient emphasis in books on statistics, but as practical medical statisticians, we spend much more of our time giving advice on the design of the studies than we do on actual analysis". Consequently, the focus of this book is not on the different statistical tests, but on the design of (most) clinical studies. Therefore, *CMJ* readers interested in statistical tests and statistics in some other fields of biomedical research should consult some other manuals.

"Medical statistics" provides an excellent overview of clinical studies and introduces the reader to medical research. It can be recommended not only to medical students but to medical practitioners as well. Although "most medical practitioners do not carry out medical research… if they pride themselves on being up to date, they will definitely be *consumers* of medical research". This book can help them consume, "digest", and apply the research in everyday work.

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1 Emerson JD, Colditz GA. Use of statistical analysis in the New England Journal of Medicine. N Engl J Med 1983;309:709-13.

2 Petrovečki M. Approach to scientific research [in Croatian]. In: Marušić M, Petrovečki M, Petrak J, Marušić A, editors. Introduction to scientific research in medicine. 2nd ed. Zagreb: Medicinska naklada; 2000. p. 63-73.