

Lang TA, Secic M. **How to Report Statistics in Medicine. Philadelphia: American College of Physicians;** 1997. 367 pages; ISBN 0-943126-44-4; price US\$39.95

I think it was H. G. Wells who once said that statistics will eventually become a way of thinking. Although I am not a big fan of Mr. Wells, I must agree with him. Statistics is becoming an important part of everyday life of common people, not only the scientists. Therefore, it is not only important that one knows how to perform a certain statistic test or calculation but also how to present her/his data to the public.

"How to Report Statistics in Medicine" is another in a series of books published by the American College of Physicians. It is written by experts in the field: Thomas A. Lang, MA, is the Manager of Medical Editing Services at The Cleveland Clinic Foundation, where he supervises editing of scientific manuscripts for publication in peer-reviewed journals; and Michelle Secic, MS, is a biostatistician in the Department of Biostatistics and Epidemiology at The Cleveland Clinic Foundation where she collaborates with researches in the design, conduct, analysis, and reporting of medical research protocols.

The book is written in an easy-to-read English (very important for non-English readers), and divided into 4 parts. Part 1, divided into 15 chapters, consists of annotated guidelines for reporting statistical information. In every chapter (except Chapters 13 and 14), guidelines addressing the major parts of scientific manuscript (introduction, materials and methods, results, discussion) are given in a form of a check list. Subguidelines are given for special cases. The authors also point out possible reporting or interpretation problems associated with a particular guideline, and solutions to the problems are included.

The first chapter deals with reporting research designs and activities. Those guidelines address a broad range of issues that may arise in reporting original research, including the aim of the study, study design, sampling techniques, and data collection methods.

Chapter two explains descriptive statistics: precision of observations and measurement, percentages, normally and non-normally distributed data, paired data, and transformed data. The authors deal with some very frequent mistakes such as unnecessary precision, treating ordinal data as continuous data or summarizing continuous data with the mean and the standard error of the mean (the latter one often seen even in some very fine journals!). The following few chapters (Chapters 3-5) describe other basic concepts. Confidence intervals, one of the most important statistical parameters and often neglected, are discussed in Chapter 3. Statistical tests are, de facto, the basic part of statistical analysis. However, if you carefully read scientific reports or papers, you can find numerous mistakes. The use of a one-tailed statistical test is rarely justified. A priori power calculation, a very useful tool (1), is often omitted. Many researches use t tests and F tests, due to their power (2), but the use of those tests is sometimes inappropriate. Very often P value is expressed as being either bigger or smaller than 0.05, although stating the actual P value would be more accurate. And there is, of course, the question of "statistical difference" and "clinical importance". All these problems are discussed in Chapter 4. Another very important issue is multiple testing (Chapter 5). Suppose that one sets alpha level (the threshold of statistical significance) at 0.05 and calculates 100 P values out of the same set of data. Then it is very likely that 5 out of those 100 P values will be less than 0.05, even if the null hypothesis is, in fact, true. Although multiple tests are sometimes not only unavoidable but even desirable, one must always be cautious with them.

After explaining the basic concepts of a statistical report, the authors proceed with the description of specific statistical tests. The first is association (relationships between categorical variables) and correlation analysis (relationships between continuous variables) (Chapter 6). The proper use of most common parametric and non-parametric tests is described. In the following chapters, the focus is on the analysis of multiple variables. Chapter 7 deals with reporting regression analysis. The discussion includes simple and multiple linear regression analysis (predicting one continuous response variable from one and two or more explanatory variables, respectively), and simple logistic regression analysis (predicting one binary categorical response variable from one explanatory variable). Like other statistical handbooks, the authors prefer "y=a+bx" form of equation of the line. However, the usual "mathematical" form is "y=ax+b" (3). Another way of analyzing multiple variables, ANOVA or F test, is the subject of Chapter 8. The authors describe different variations of this method (one- and multi-way

ANOVA, analysis of covariance, repeated- measures ANOVA) and their proper use.

Physicians will probably find Chapters 9 and 10 particularly useful. Chapter 9 deals with reporting survival analysis. The emphasis is on the Kaplan-Meier method (including the Kaplan-Meier curve) as the most common method used to estimate the survival rate. Chapter 10 discusses reporting the characteristics of diagnostic tests including sensitivity, specificity, likelihood ratios, positive and negative predictive values. Although definitions of those and other related terms can be found in practically every book on epidemiology and biostatistics, it is often very hard to find out what some of those terms actually mean for both the patient and his physicians. Most books cite mathematical formulas used for computation and state, for example, that the sensitivity is  $a/(a+c)$ . It is probably very hard for physician to figure out the relationship between  $a/(a+c)$  and his everyday work. After reading this book, one can understand those terms and use them to improve her/his clinical practice.

Epidemiologists and other public health professionals will find important information in the following two chapters dealing with meta-analysis and medical economics. Chapter 11 explains the use of meta-analysis, including some controversies in the field. Chapter 12 deals with terms such as "economic evaluation", "pharmacoeconomics", and "technology assessment". Because of the growing importance of medical economics, this part of the book can be very useful for a broad range of health care professionals. Two other very important and "hot" issues, decision analysis and clinical practice guidelines, are discussed in Chapter 13.

Chapter 14 provides a brief overview of Bayesian statistical analysis, an alternative school of statistics, which has not been commonly used in biomedical research.

The last, very short but very useful, chapter provides information for reporting outcomes of a study in clinically applicable terms. Although one can make really important and outstanding clinical research, and present the results of the research accurately, it is possible that the physicians and other health care workers will find the results hard to understand and useful in everyday work. Six conventions for reporting results in more clinically applicable terms are stated in this chapter. The most important one is that the researcher should always, if possible, state "How will the results of my work alter medicine?".

The second part of the book is a guide to statistical terms and tests. In a form of a dictionary, it describes many common statistical terms and concepts. These explanations provide a very fine overview of the field and are very useful not only for people not familiar with statistics but for more experienced users as well.

Part 3 is an unannotated, referenced list of the guidelines. It provides a quick reference to all guidelines and states the references that support or explain importance of each guideline. It also provides suggestions for additional reading.

The last part of the book is composed of four appendices. Appendix 1 is a checklist for reporting clinical trials. It includes the CONSORT Statement (Consolidated Standards Of Reporting Trials): a checklist for reporting randomized controlled clinical trials (4). For example, JAMA requires authors submitting manuscripts for publication to include all information on the CONSORT checklist. Appendix 2 is a list of mathematical symbols and notation commonly used in statistics. It is useful to know that Greek letters usually refer to characteristics of a population and Roman letters usually refer to characteristics of a sample. The authors recommend "P" as a symbol for probability, although some journals use "p". Appendix 3 deals with rules presenting numbers in text. Some very useful advises can be found in this chapter. The percent sign is written without a space between the numeral and the sign (for example 50%). Ranges of numbers should be reported with terms "to" or "through" and never with a hyphen (e.g., 5 to 10 mg, not 5-10 mg). Appendix 4 includes spelling of statistical terms and test. Anyone who has ever edited a scientific journal or prepared a manuscript for a journal will appreciate the three appendices. I have for a long time thought that "the Kruskal-Wallis test" is spelled "the Krus-Kaalvalis test".

There are also three very short but very useful language tips in this book. For example, commonly used terms "randomization", "blinding", and "compliance" should be replaced with "randomly assigning", "masking", and "adherence", respectively.

Although there are numerous statistical handbooks, textbooks, and manuals, a book like this is hard to find. The authors have provided a step by step, fully detailed guide to statistical issues addressed in each of main parts of a scientific manuscript. It is important to stress that this is not a classic statistical textbook. Rules and calculations of particular statistical tests are not included. Instead, it will help the readers to understand frequently used statistical methods and to avoid common mistakes. I cordially recommend this book to everyone: scientists, editors, peer reviewers, and students. It will help the authors to prepare their manuscripts for publishing, to give their reports a really "professional" look, to avoid the most common "traps", and to satisfy even the most demanding editors (e.g., the editors of the Croatian Medical Journal). It will help the editors to improve the quality of their journals.

It will show reviewers what to look for in a manuscript. It will help students to understand basic concepts of statistics and use of the most common statistical methods and tests. I had a lot of fun reading and hope you will, too.

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#### References

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