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The Science of Biostatistics in Decision Making within Health Sciences

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Abstract

Biostatistics is a science developed for the field of health. It is not the application of another branch of science. Because it has its own laws. It includes many original methods for problems and hypotheses that require evidence-based solutions in different fields of health sciences.

Biostatistics has a working environment in all fields of science and is multi-disciplinary. The biostatistician ensures that the results are presented appropriately in articles and publications by using statistical methods and analyzes for hypothesis appropriate to the data. These tasks are similarly formulated in the ICH E6 guideline on good clinical practice. The discourse in the guide is exactly as follows; "The sponsor should utilize qualified individuals (e.g. biostatisticians, clinical pharmacologists, and physicians) as appropriate, throughout all stages of the trial process, from designing the protocol and CRFs and planning the analyses to analyzing and preparing interim and final clinical trial reports."

Unfortunately, today there is no good and adequate education that teaches statistical thinking. For this reason, many errors are made in hospitals and in scientific journals. As a result, in order to break the current erroneous loops, it is necessary to instill and teach correct decision-making, statistical thinking, variation and methodology starting from primary school education as other courses are given in the first years.

Key words: Biostatistics, Decision Making, Statistical thinking

Introduction

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problems and hypotheses that require evidence-based solutions in different fields of health sciences.

Biostatistics has a working environment in all fields of health sciences and is multi-disciplinary. The biostatistician ensures that the results are presented appropriately in articles and publications by using statistical methods and analyzes for hypothesis appropriate to the data. These tasks are similarly formulated in the ICH E6 guideline on good clinical practice as if;

"The sponsor should utilize qualified individuals (e.g. biostatisticians, clinical pharmacologists, and physicians) as appropriate, throughout all stages of the trial process, from designing the protocol and CRFs and planning the analyses to analyzing and preparing interim and final clinical trial reports." (1).

The quality of medical research depends, among other things, on the specific statistical planning of the study, on the analysis of the data using evidence-based methods, and the reporting of results, usually verified by a biostatistician (2). Nowadays, with the introduction of "evidence-based medicine", more emphasis has been placed on biostatistics, research methodology. Evidence-based medicine guidelines are mainly based on the results of Meta analysis based on evidence from a series of randomized controlled trials. The doctor tries to provide his patients in the clinic with the strongest evidence in the decision-making process for the best treatment options. The biostatistician should choose and use the correct and powerful statistical method to obtain the most accurate result for the clinician (3).

Analysis in Scientific Research

Statistics in Decision Making

All issues related to diagnosis, treatment, clinical practices, research, orientation, coordination and control are resolved by the decisions made by the practitioners. Objectives, strategies, policies and organizational designs must all be decided in order to resolve all health related problems. The management process is based on decisions. Decisions are needed both to overcome the problems and to make the most of the available opportunities. The right decisions reduce the complexity, uncertainty and variety of health problems.

The foundation of credibility in planned research begins when the study begins. What the resources are should be reviewed and the most important thing is to minimize the bias of the researcher, if any. The purpose of the analysis to be done is to organize and interpret the collected data objectively and to draw realistic results from it (4).

Statistics are largely the basic thought processes they use in estimation, inference, control and experimental design, and are the cornerstones of management. Statistical thinking is therefore in the public domain. Therefore, everyone should own it and use it. Statistical

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thinking can create a new paradigm for management. In the short term, it can improve the quality of decisions; In the long run, it can help managers become leaders. To actually minimize variability, sources of variation must be identified and eliminated (or at least reduced). The Role of Statistical Thinking in Management Managers should use process thinking, understand variation, and use data to guide actions (5).

Stages in Decision Making present with Figure 1.

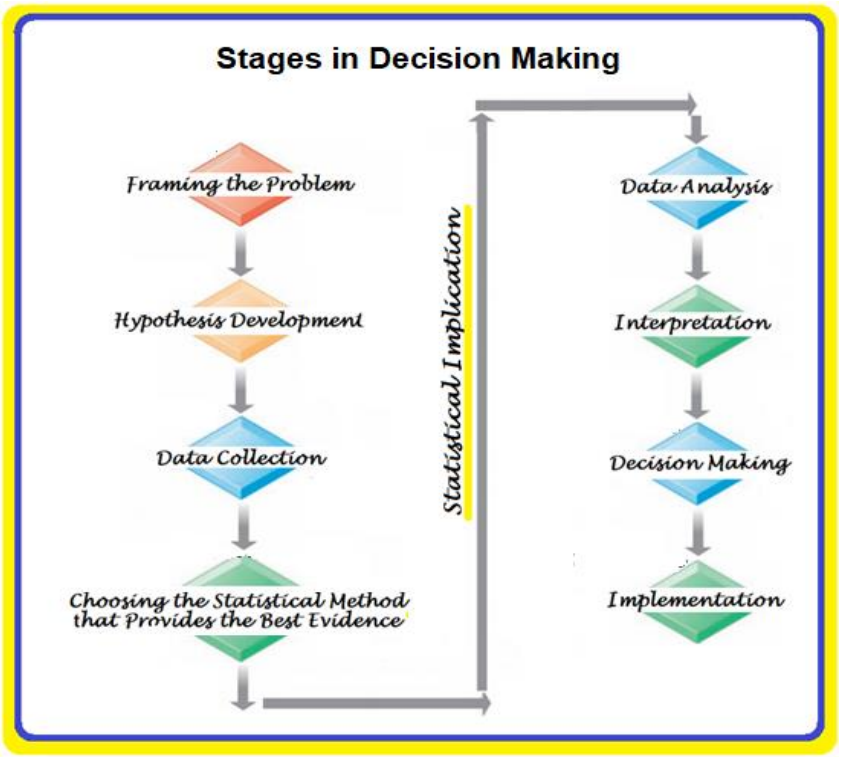

Figure 1. Stages in Decision Making

According to Figure 1. There are main eight stages in decision making process these are as follows;

1. Framing the problem

2. Hypothesis development

3. Data collection

4. Choosing the statistical method that provides the best evidence

5. Data analysis

6. Interpretation

7. Decision making

8. Implementation

Statistical thinking in decision making, statistical inferences, suggests and provides important solutions in problem formulation, hypothesis development, data collection, data analysis, evidence-based method selection, interpretation, decision making and application of results. A statistical thinker can also look beyond the variables suggested by the practitioner and protect against ignoring influential variables or drawing erroneous causal conclusions. Often times, people tend to jump to causal consequences. In general, researchers should realize that they might not be able to predict all relevant variables; before collecting data, it is important to see the importance of brainstorming, discussing with practitioners and properly designed experiments.

Unfortunately, the real role of statistics in research is still unknown to some amateur researchers. The methods developed by statistics are an important branch of science in obtaining new interpretations and new solutions. It allows and allows us to make sense of data that we cannot otherwise obtain. Still, volatility issues greatly affect the knowledge we can learn.

In every field of medicine, continuous decisions are made regarding the diagnosis and management of patients. Decision making about the patient is the most reliable point for the patient's treatment. Unfortunately, doctors often do not receive extensive training in this basic skill. The two primary decision-making modes are intuitive and analytical. Physicians must be clearly taught the features of intuitive thinking and the decision-making that comes with it. The final part of the model is a calibration junction. The mark of a well calibrated thinker is the ability to balance the right blend of intuition and analytical reasoning in decision making for a particular situation (6).

S8tatistics have developed methods to explain the variables that make the variation in the problem complex, to determine and reveal their degree of influence. Correct decision-making based on evidence can already be achieved by explaining this complex structure.

Decision makers need to know that they understand the general statistical process from the point of data collection. The focus is on the picture too big from a given angle. They need to demonstrate their ability to apply their statistical knowledge to answer a question of interest.

The development of statistical thinking should be specially developed for all decision makers. The development of the types of thinking used by statisticians, ways of approaching problems and applying methods should be taught to all decision-makers. This education should

start from the first years of school. These methods largely overlap with improving student literacy and reasoning. It is necessary to dive deeper into these examples and provide more open-ended problems. In order to determine whether students apply statistical thinking in the education process, problems that test student reflexes, thought patterns and development in new situations should be designed. Decision making practices should be demonstrated with statistical methods.

In order to focus on statistical literacy, statistical reasoning, and statistical thinking, statistics education has become more current in the last decade. Many recommendations have been given for how statistics courses should be taught (7). In research, a four-dimensional framework for statistical thinking has been determined. The research cycle includes the inquiry cycle, types of thinking and trends. These processes should be characterized by means of models that can be used as a basis for tools or frameworks for the development of problem solving. Statistical thinking is the cornerstone at the core of statisticians' art. Statistical thinking is the statistical incarnation of "common sense. The literature on statistical thinking is insufficient. Statistical thinking is a set of interdependent processes that all work "thinking processes that acknowledge that variation is around us and exists in everything we do. Identifying, characterizing, quantifying, controlling, and reducing variation provide opportunities for improvement." We investigate the complex thought processes involved in solving real-world problems using statistics to improve such problem solving. Therefore, a framework for problem solving, problem solving strategies and thinking patterns related to the integration of statistical elements with problem solving. we are interested in improving (8, 9).

The most important part of the quality and ASA definitions of statistical thought is "variation" or "variability". Any serious discussion of statistical thinking must examine the role of "variation". The first three "variation" messages are: variation is ubiquitous; variation can have serious practical consequences; and statistics provide us with a tool to understand a world surrounded by variation (9, 10).

Teaching statistical thinking and explaining the integration of statistics into the scientific process is an important part of fixing our scientific mechanism. We claim that the more scientists and the more clearly understand the interactions, the more error will be in how the scientific method is applied and that we will take a big step forward in moving beyond the "bright line rule" of $p < 0.05$ (11).

Unfortunately, today there is no good and adequate education that teaches statistical thinking. For this reason, many errors are made in hospitals and in scientific journals. As a result, in order to break the current erroneous loops, it is necessary to instill and teach correct decision-making, statistical thinking, variation and methodology starting from primary school education as other courses are given in the first years.

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References

1. Guideline for Good Clinical Practice. ICH Topic E 6 (R1). European Medicines Agency.

https://www.ema.europa.eu/en/documents/scientific-guideline/ich-e6-r1-guideline-good-clinical-practice_en.pdf Access January 2021

2. Zapf A. Rauch G and Kieser M. Why do you need a biostatistician? BMC Medical Research Methodology (2020) 20:23.

3. Al-Tawil NG. Role of biostatistics in medical research Editorial. Zanco J. Med. Sci., Vol. 17, No. (2), 2013

4. Bengtsson M. How to plan and perform a qualitative study using content analysis Nursing Plus Open Volume 2, 2016, Pages 8-14

5. Lynne B. Hare LB, Roger W. Hoerl RW, John D. Hromi JD, and Ronald D. Snee RD .The Role of Statistical Thinking in Management. file:///C:/Users/User/Downloads/SneeetalStatThinkinginManagementQP1995%20(1).pdf Access January 2021

6. P.R. Barach et al. (eds.), Pediatric and Congenital Cardiac Care: Volume 2: Quality Improvement and Patient Safety, Springer-Verlag London 2015. Croskerry P Chapter Title: Clinical Decision Making Clinical Decision Making. Springer-Verlag London.

7. Dani Ben-Zvi D. and Joan Garfield J. The Challenge of Developing Statistical Literacy, Reasoning and Thinking. Kluwer Academic Publishers. 2004

8. Britz, G., Emerling, D., Hare, L., Hoerl, R. & Shade, J. (1997). How to Teach Others to Apply Statistical Thinking. Quality Progress, June 1997, 67-79

9. Wild, C.J. & Pfannkuch, M. (1999). Statistical Thinking in Empirical Enquiry. lnternutionul Stutisticul Review, 67, 223-265.

10. Pfannkuch, M. Statistical Thinking: One Statistician's Perspective. In People in Muthemutics Educution. Proceedings of the Twentieth Annual Conference of the Muthemutics Educution Reseurch Group of Austrulusiu, Eds. F. Biddulph and K. Cam, pp. 406-413. Hamilton: MERGA Inc. (1997).

11. Steel EA, Liermann M and Guttorp P. Beyond Calculations: A Course in Statistical Thinking, The American Statistician, 73:sup1, (2019) 392-401