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Medical Errors Third Cause of Death: Evidence-Based Biostatistics Methods for Making the Right Decision

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Abstract

Medical errors continue to cause preventable diseased deaths. It is imperative that all countries take urgent measures in this regard. It is a fact that errors made with wrong decisions can only be corrected with education. Evidence-based Biostatistics methods given to all healthcare professionals is not sufficient.

Clinicians should always keep in mind that diagnosis and treatment and practice must be evidence-based. Biostatistics education teaches evidence-based methods in the field of health care. Unfortunately, this education is not sufficient in the whole field of health. The inadequacy of biostatistics education is one of the factors affecting such medical errors.

The difficulty of Biostatistics is sometimes mentioned. However, those who have this thought should remember; "**If people believe that Biostatistics is difficult, it is only because they do not realize how complicated the diseases and life is, and they don't remember how some bacteria and viruses threaten the world. Biostatistics methods reconstruct the mind for analysis, evidence-based alternative thinking, comparison, and complexity, which are the foundation of decision making. Biostatistical thinking does not accept any suggestions that are not evidence-based. We should teach this biostatistical idea to all our healthcare professionals, both theoretically and practically.**

Therefore, it shows that Evidence-based Biostatistical methods in medical education should be increased more and more. Not only theoretically, but also by considering new hypotheses, applications should be made on how to realize their solutions. Only in this way, the ability to make the right decision based on evidence is developed. Biostatistics education based on analysis and evidence should be given to physicians at every step to reduce the lives taken by medical errors.

Key Words: Medical errors, Biostatistics, Decision making

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Medical errors are the third-leading cause of death after heart disease and cancer. A recent Johns Hopkins study claims more than 250,000 people in the U.S. die every year from medical errors. Other reports claim the numbers to be as high as 440,000. The biggest reason for this disaster is due to not being able to make the right decision about the diseases (1).

Medical errors continue, although less so than in the past. Medical error is a preventable adverse effect of medical care, whether apparent or harmful to the patient. High error rates resulting in death are most likely to occur in intensive care units, operating rooms, and emergency rooms. Pharmacists, nurses, and physicians, all healthcare professionals must be aware that medical errors not only cause harm to patients but also lead to legal lawsuits. Clinicians need to confirm repeatedly before making a diagnosis. The pharmacist should check the interaction of the drug. Before administering medicine, the nurse has to check the correct dose, the correct medicine, and the correct patient. There are many causes of medical errors. Today, most hospitals try to minimize these errors with their control system. As a result, constant awareness by every member of the interprofessional team is the only way to reduce medical errors (2).

Today, there are evidence-based biostatistics and science branches in all medical faculties throughout the world. The science of biostatistics teaches evidence-based decision methods to all health professions, especially to physicians. As a person who has been teaching Biostatistics in Medical faculties for forty years, I argue that this education is not enough. Unfortunately, in some faculties, evidence-based Biostatistics methods fall short of their purpose, as they are given in a formulaic mess. In particular, Biostatistics education should be carried out step by step. Biostatistics thinking education should be given at the first stage. In other steps, the use of the methods and their place and meaning in the literature should be given.

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Statistical thinking captures a complex world, the fundamental aspects of its structure, and also shows us how inadequate we are about our knowledge. We can distinguish statistical thinking from other forms of thinking that are less likely to describe the world accurately. Intuition fails us because we often rely on the best guesses (what psychologists call heuristics)

that can get it wrong. Statistical thinking gives us the tools to more accurately understand the world and overcome the fallibility of human intuition (3).

Evidence-based methods of practice are becoming widely used in many areas of healthcare. In recent decades, Biostatistics has come to play an increasingly important role in the methodology of the medical sciences. In recent years, clinical research has been redefined by the application of biostatistical methods. As it is known, science is developed by best evidence methods, not by materials. Biostatistics is the main inferential tool used in science and medicine. Therefore it defines that is the center of all sciences and develops evidence-based decision methods for sciences. It provides a process for drawing valid conclusions and making reasonable decisions based on such analysis. Medicine must be building as a central part of its scientific base a solid underpinning of biostatistical knowledge (4).

The first, evidence-based data, observations, the results of the decision-making process, and the process itself is important in decision making. It should be included in the selection of all critical variables in decision-making and the evaluation of the consequences of decision-making. Any observation that affects variation should never be excluded.

The most important point to be considered in decision-making is that all results affecting decision-making are evidence-based. In the scientific field, the most important evidence in data is provided by statistical methods.

Decision making, first of all, the number of observations, that is, the sample size should be sufficient. Sample size should be determined by statistical methods on an evidence-based basis.

Sampling is the most important statistical method that ensures the unbiasedness of the data. Using the random numbers table developed with simulation methods is the most important way to ensure randomness. High-evidence sampling methods use a table of random numbers. In the decision-making process, every step should be evidence-based. It should not be forgotten that personal opinions or thoughts that are not based on evidence have significant negative effects on wrong decision-making.

Some authors have different opinions. e.g; "**Systematically improve science literacy and communication. Our medical journals need to emphasize the importance of base rates, rather than just presenting potentially confusing statistics like relative risks, sensitivities, and specificities**." (5).

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Statistics Science has developed the Relative Risk formula to decide whether an agent is considered a risk or not. How to decide whether a factor is a risk or not without using this term? Of course, it cannot be given on an evidence-based basis, nor can it be given at a simple rate.

Assuming the causal effect between the exposure and the outcome, values of relative risk can be interpreted as follows (6):

RR = 1 means that exposure does not affect the outcome

RR < 1 means that the risk of the outcome is decreased by the exposure, which is a "protective factor"

RR > 1 means that the risk of the outcome is increased by the exposure, which is a "risk factor"

When we examine the terms sensitivity and specificity, they are the two most commonly used statistical measures to evaluate the performance of an alternative test against the gold standard. One of the main purposes of making Scientific Biostatistics measurements is to accurately determine the diagnosis. Two Biostatistics measurements such as sensitivity and specificity are examples of this situation. These two key Biostatistics measurements used to characterize the quality of a test are test sensitivity and specificity (7,8).

As a result, the physician knows all the anatomical terms in the human body. To understand research articles, or to make an accurate diagnosis, it is imperative to know the terms of evidence-based biostatistics.

Medicine is a multidisciplinary field. Biostatistics is an important branch of medicine. Purpose; to develop evidence-based methods and to teach correct decision making. The purpose of the methods; The doctor is not just about teaching complex formulas. As the doctor learns the method, he gets his mind and ability to make the right decision in the clinic ready.

The main cause of death in COVID-19 patients is respiratory failure, acute respiratory distress due to inflammation of the pleura caused by the cytokine storm, inflammation of the lungs, coagulopathy, end-organ failure, septic shock, and more infections associated with secondary infections leading to death (9).

As you can see, the virus affects many variables at once. It also develops a new mutation each time. How is this complex structure resolved?

Biostatistics has developed roughly univariate and multivariate methods. The biostatistical concept univariate involves the analysis of a single variable. Of course, univariate methods are easier than multivariate methods. It is a fact that the treatment of the coronavirus, which affects and is affected by many variables, can be analyzed not with single variable statistical methods, but with multivariate advanced statistical methods.

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The expression multivariate analysis is used to describe analyses of data that are multivariate in the sense that numerous observations or variables are obtained for each individual or unit studied (10).

Multivariate thinking is defined as a set of thought processes that illuminates the interrelationships between and within many variables. The essence of multivariate thinking proposes to reveal the internal structure of various multi variables. Multivariate methods allow us to analyze a complex set of variables and provide more assurance that we can arrive at some synthesis results with less error and greater validity than if we analyze the variables individually. The study of multivariate thinking and methods encourages coherence and integration in research that hopefully can motivate policy and practice (11).

As can be seen, multivariate Biostatistics methods are progressing with methods that provide important solutions for more complex hypotheses without breaking the whole by analyzing many variables together.

Therefore, it shows that Evidence-based Biostatistics education in medical education should be increased more and more in education programs. Not only theoretically, but also by considering new hypotheses, applications should be made on how to realize their solutions. Only in this way, the ability to make the right decision based on evidence is developed. Biostatistics education based on analysis and evidence should be given to physicians at every step to reduce the lives taken by medical errors.

References

1. Sipherd R, special to CNBC.com. Modern Medicine. The third-leading cause of death in US most doctors don't want you to know about. Published Feb Thu, Feb 22 2018 9:31

https://www.cnbc.com/2018/02/22/medical-errors-third-leading-cause-of-death-in-america.html

2. Carver N,; Gupta V and Hipskind JE. ; Medical Error , Copyright, 2021, StatPearls Publishing LLC. July 9, 2021. https://www.ncbi.nlm.nih.gov/books/NBK430763/

3. Poldrack RA. Statistical Thinking for the 21st Century. Copyright 2019

4.Celik Y. Statistics is the Science that Provides Best Evidence Methods for All Sciences International Journal of Basic and Clinical Studies (ijbcs.com) 2018; 7(1): 1-6.

5.Morgenstern J, Raz M, Editors: Pouryahya P. Decision Making in Emergency Medicine. Base Rate Neglect, Section 10, Springer Nature Singapore Pte Ltd. 2021

6. Celik Y. Modern Biostatistics Scientific Research Methods. Hunkar Ofset, Istanbul, 2020

7. Monaghan, TF.; Rahman, S.N.; Agudelo, C.W.; Wein, A.J.; Lazar, J.M.; Everaert, K.; Dmochowski, R.R. Foundational Statistical Principles in Medical Research: Sensitivity, Specificity, Positive Predictive Value, and Negative Predictive Value. Medicina 2021

8. Keni R, Alexander A, Nayak PG, Mudgal J and Nandakumar K (2020) COVID-19: Emergence, Spread, Possible Treatments, and Global Burden. Front. Public Health 8:216. doi: 10.3389/fpubh.2020.00216 https://doi.org/10.3389/fpubh.2020.00216

9. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet. (2020) 395:1054–62.

10. Abdelmonem Afifi A, Robin SMA. Clark DVA. Practical Multivariate Analysis. Taylor & Francis Group, LLC CRC Press 2020

11. Harlow LL. The of Multivariate Thinking. Basic Themes and Methods. Essence The Lawrence Erlbaum Associates, Inc. 2005