

# Medical publication and scientometrics

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As the fact that today is conducted a number of scientific research works in the field of medicine, it is necessary to define the steps by which it is carried out to make it universal and to have scientific value. This paper describes the research methods, study design, the way in which one should be written, and why it is important to publicize the same. Special emphasis is placed on scientometrics as the science that evaluates scientific papers and their citation in the selected sample of journals. The paper also answers why scientific research works should be carried out and what kind of satisfaction they provide to the researcher.

**Key words:** Method, publication, research, scientometrics

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## INTRODUCTION

True knowledge is gained through scientific research.<sup>[1-5]</sup> The highest level of knowledge is the ability to investigate scientific problems. Medical scientific research is a process of systematic studies of individual, particular aspects of the physical, mental, and social well-being. Those articles which include clinical and public health research in the group include research on a population level. Research process can be extremely exciting to researchers because not only the results are those that are important but the research itself, involvement in the problem, exploration of the unknown and discovering answers to the previous set of unanswered questions.<sup>[6-10]</sup>

In order that research project is valuable and recognized by the academic community and other researchers, it is important to contain the same elements as the previous written works. It is immaterial whether the research is conducted by a student or a teacher, all the steps are defined, and in a nutshell they are: Identifying the issues that will be explored, data collection, analysis of the collected evidences, and reaching a conclusion.<sup>[2,11-13]</sup>

## PURPOSE AND PROCESS OF MEDICAL RESEARCH

Researchers in medical research examine the biological, socio-economic, and environmental factors that influence health and contribute to the development of disease, disability, or death. Research at the population level has defined goals and the most important are as follows.<sup>[1,3,9]</sup>

- Identifying and classifying new clinical identity

- Detect risk factors for disease
- Development and testing of new protocols for the prevention or treatment of disease

The idea that researchers will get rich or become famous after writing scientific article must be immediately discarded.<sup>[3,13]</sup> It usually takes a few months or even years until the initial idea of the study comes to the end of work and set of conclusions. Even after publishing, only a small number of articles lead to the current changes in health status or clinical practice. However, the researcher can still enjoy the fruits of their labor through:

- The acquisition of new skills
- Satisfying its own curiosity
- The ability to publish their own work

However, the most satisfaction for any scientist, especially the young, should be the knowledge that the result in a particular way in the future will affect at least one person to be healthier. This should be the fundamental reason why the research is conducted.

Author Kathryn H. Jacobsen in her book "Introduction to health research methods: A practical guide"<sup>[2]</sup> states that any research process consists of five steps. The first step is identifying the problem that we want to explore and the second is to choose the research manner. Once the goals are set, the other three steps involve study design and data collection, data analysis, and writing conclusions.

Scientific researchers in the field of medicine interact through published articles or presentations presented

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at professional meetings (e.g. conferences). That research which is not published or displayed in another way cannot affect the practices that can make people healthier. For this reason, scientists are encouraged, especially young ones, after completing the project to publish scientific work in a professional journal.

## IDENTIFYING THE PROBLEM

The first step includes actions such as:

- Selection of topic
- Literature retrieval
- Focusing on the question posed in the survey.

This step is probably the most challenging part of the research project. In this step, the creativity is not only allowed, but is obligatory. Selection of research topics usually reflects personal affinity of the researchers for the problem. One of the most commonly used methods in the selection of research topics is brainstorming which aim is to create a nice long list of possible research topics. After the researcher searched the databases with summaries of previously published papers, journals and books, consult with colleagues, he gained insight into the possibilities for research and expand the list of possible topics for research.<sup>[2]</sup>

When are identified possible research topics, it is important to formulate them so that each includes three important elements: Exposure, disease or outcome, and the population. When these three items are defined, they should be combined to form a research question that must be answered, for example: Is physical activity associated with increased risk of bone fractures in adults with diabetes? In fact, physical activity is exposure to potentially provoking factor, bone fractures is a disease or condition, and adults with diabetes represent a population among which to perform the research.

### Literature retrieval

Once the field of research is chosen, the researcher needs to explore the existing literature that could be used for the research. Usually, first is explored basic information on the internet. Organizations that deal with public health such as the World Health Organization (HFA - Health for All Databasis) and the U.S. Center for Disease Control and Prevention have basic information on various diseases and risk factors for their occurrence. It might also be helpful finding statistical data for a particular problem, and once the exposure, disease or outcome, and population is identified.

Abstract (summary) presents a brief description of an article, chapter, or book, and the length is one paragraph. Abstracts in medical science give a glimpse into the design of the study, the population covered, and the key words

that are related to the research. Many databases contain such abstracts, and we will mention just a few: MEDLINE, SCOPUS, EMBASSE, ISI Web of Science, EBSCO, etc. The most important of these is PubMed, which contains more than 21 million abstracts (most of them from MEDLINE and PubMed Central).<sup>[2]</sup>

If the researcher cannot get from the database insight into the whole article, it remains the possibility to directly contact the author and ask for a copy of the same. After receiving the article, the researcher should re-read the summary, review charts and tables because usually the most important results are presented graphically, and read the whole article to get a real insight into the problem.

### Focusing on the question set in research

Having selected research topics, researcher should focus on the specific question to which research should provide the answer. What will be the guiding question in the study also depends on the type of study that will be conducted. By the manner in which data will be collected, we can distinguish three types of studies:

- The primary study: Collecting and analyzing new data
- Secondary studies: an analysis of existing data
- Tertiary study: A review and synthesis of existing literature.

## CHOICE OF STUDY DESIGN

Commonly used study designs are:

- A meta-analysis
- Correlation (ecological) studies
- Case studies and case series studies
- A cross-sectional study
- Cohort study
- Experimental
- Controlled studies (case control),
- Qualitative study.

The study design must be appropriate to the goals that have been previously set. For example, if the objective is to evaluate whether an intervention is effective, the most appropriate study would be experimental. On the other hand, if we want to understand certain populations, the best would be to apply some of the observational studies such as a cohort or cross-sectional study.

Each of the listed types of studies is focused on a specific population. Thus, for instance, case studies and controlled studies are focused on individuals with a specific disease, while cohort studies are more concerned with an individual's exposure to the risk factor.

Researchers who have fairly easy access to the population of interest, such as a group of individuals with a specific disease

or exposure to a risk factor, usually elect for the study design that is appropriate for the participants in the study.

### Meta-analysis

Usually, the goal of scientific research is to explore a new identity and give insight into its characteristics. However, the goals of meta-analysis are synthesis of already known facts obtained in previous studies and offer a new interpretation of the results. Meta-analysis of the research in the field of medicine requires:

- Extensive literature search
- Extracting key information from relevant articles
- The clear and concise presentation of information.

Meta-analysis can often be a helpful step in the preparation of a primary or secondary research. It offers the researcher possibility to become an expert in literature searches. In some occasions the conclusions of meta-analysis are more than an interpretation of the study involving a synthesis of knowledge from a large number of articles.

However, it is important to note that in academic circles meta-analyses are considered as less valuable scientific works. Also, there are journals that do not publish meta-analyses and therefore their popularity is lower.

### Case study and study of series of cases

Case study describes one patient. The study describes a series of cases of two or more patients who have the same condition or disease, or who are subjected to the same procedure. Such research is possible only when there is adequate access to the source of the observed cases. This type of study is carried out if we want to:

- Identify new syndromes
- The hypothesis for future research
- Describe the characteristics and similarities among patients with the same signs and/or symptoms of disease.

### Cross-sectional study

The aim of cross-sectional studies is to measure the exposure of the population or part of a particular risk factor or disease at a given point in time. This type of study is used to:

- Describe community
- Evaluate health programs
- Assess needs of the population.

### Controlled study

Controlled study (case-control studies) is comparing exposure to a particular risk factor in patients who are also those in which there is no disease. Its goal is to identify risk factors for certain diseases. Participants in this study were selected according to whether they are sick or not. Therefore, those who have the disease belong to the group of cases, and those with no illnesses in the control group. Controlled

studies are among the best to determine the risk factors for certain diseases.

### Cohort study

A cohort is a group of similar people who are monitored during a certain time. All cohort studies involving at least two measurements as follows:

- During the initial research confirming the existence of the primary exposure and disease in all study participants
- Over the next assessment while measuring the incidence of new disease in relation to the initial survey.

## STUDY DESIGN AND DATA COLLECTION

The third step involves creating a detailed plan to carry out the study. There are different protocols for primary, secondary, and tertiary type of study. However, in any of them we should think about the following:

- Data collection methods
- Selection of the sample population
- Creating questionnaires
- Research and interviews
- Additional assessments
- Approval of the ethics committee
- Resources to conduct research
- Financial resources and budget
- Time limits.

One of the most important steps in creating a study is to select a suitable sample from the population that will be processed. We distinguish four distinct entities to consider before data collection. The broadest term is the target group to which may apply the results of the research. Within that group we separate well-defined subset of individuals from the target group. The sample population includes individuals who were asked to participate in the study and the study population group consists of those who have actually consented to participate.

The questionnaire is a tool by which researchers systematically collect information from participants in the study. For any topic in the field of health care, one can make the questionnaire. Best questionnaires are those who are skillfully made for a specific purpose.

Most primary studies collected data from research participants through the interview. Interviews are suitable for data collection because they can complement also other findings. Additional assessment incorporates: Anthropometric measurements, vital signs, clinical examinations, tests, physiological functions, laboratory analysis, medical imaging, diagnostic procedures, etc.

All researchers have an ethical obligation to reduce to a minimum the risk that could have participants in the study. Ethics Committee must protect research participants, researchers, and institutions in which the process is carried out. It is unacceptable to conduct research for which protocols the ethics committee had not given consent.<sup>[1]</sup>

## DATA ANALYSIS

The fourth step in the research is the processing of the data collected. Most studies require only a descriptive analysis and some comparative statistical analysis. Data are usually recorded in some of the software used for databases processing such as Microsoft Access. After the data has been entered, they can be imported into one of the standard software for statistical analysis. For statistical analysis most of researchers now use SPSS software package, Statistical Package for the Social Sciences, which is very useful for epidemiological studies.

Descriptive analysis is used to describe the basic characteristics of the study population and other data sources. Comparative analyzes comparing groups of participants on the basis of age or gender, exposure or existence of disease, etc. A comparative analysis involves statistical tests that classify participants into two categories and compares the characteristics of those categories.

## WRITING AND PUBLICATION OF RESULTS

The last step in the research is to write the report and conclusions of the research and the presentation or publication.<sup>[1,3,13]</sup> Usually, the results of the work are published in the form of an article. Earlier we mentioned that every professional article must have its own summary or “distillate” which outlined what was done in the course of the research, in what way, what are the results, and the author’s interpretation of them.<sup>[4]</sup> In article, “How to Search, Write, Publish and Prepare the Scientific Papers in the Biomedical Journals”<sup>[3]</sup> states that the summary must be clear and precise. To help remember the necessary features, it is useful to use the English acronym for “Keep It Simple and succinct” - KISS.<sup>[3]</sup>

After the summary, are followed the usual parts of a professional article. Above-mentioned author in the same article provides given acronym IMRaD: Introduction, Methods, Results and Discussion, and Conclusion.<sup>[3]</sup>

### Introduction

The introduction should provide information that will help the reader to understand the methods and results of the research. The introductory section should contain a definition of the problem and the formulation of the

problem being investigated. In experimental and clinical research is necessary to specify the objective(s) of research and hypotheses (assumptions) which are included in the study.

### Methods

The description of the methods used in the study must first emphasize the study design that will be used. It is necessary to describe the main features of the study, describe the sample tested, the standard values for the tests, etc. In this paper, it is necessary to explicitly specify the parameters that are monitored and controlled during the study. This part should end with the description of the statistical methods used.

### Results

Section where we present the results of research begins with a description of the test population and clearly identifies the size of the tested sample and the demographic characteristics. The results obtained by statistical analysis should be presented in tables and charts whenever possible. When displaying the results it is necessary to mark the interval of deviation and their levels of statistical significance. In a comparative study, the interval of deviation must relate to the differences between the groups.

### Discussion and conclusion

Discussion is the most important part of the article, and it begins by summarizing the key findings obtained during the study. In it is promoted the most important results and comparison with those obtained in previously conducted studies. If they are significantly different, it is necessary to give a possible explanation for these differences. Finally, we should give a confirmation of the set objectives (goals) and confirm or reject the hypothesis. In conclusion is presented the most important facts that were obtained during the research.

### Literature review

Citing references can be done in two ways:

- In the text of which is given as a brief description of the source of information
- At the end of the document where is provided detailed bibliography information for each source.

References are often cited in the nomenclature according to Vancouver or alternatively by style called ICMJE (International Committee of Medical Journal Editors). The literature review should use only those references that are directly related to the topic of the study.

### Article publication

At the end the article should be prepared for its publication, and there are numerous reasons why researchers should publish their work. Some of them are:

- The possibility of conducting scientific dialogue

- Receiving critical review
- Showing respect for the participants and partners
- Facilitate future research
- Personal satisfaction.

## SCIENTOMETRICS

Scientometrics is part of scientology (the science of science) that analyzes scientific papers and their citation in the scientific journal selected sample.<sup>[5]</sup> Name Bibliometrics in the seventies was introduced to denote a quantitative study of the communication process using mathematical and statistical methods to books and other media of communication. Almost simultaneously, in the countries of the former Eastern Bloc was introduced scientometrics name derived from the Russian language. More specifically, in 1969 was introduced the name scientometrics related to scientific field that deals with the study of science as an information process by applying quantitative (statistical) method, and later Tibor Braun (who in 1977 established international journal Scientometrics) introduced the name Scientometrics.<sup>[6,13-16]</sup>

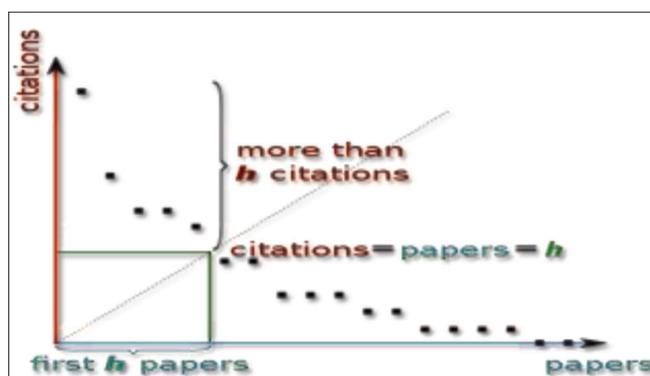


Figure 1: H-Index from a plot of decreasing citations for numbered paper (<http://en.wikipedia.org/wiki/File:H-index-en.svg>)

Some of the indicators used in the evaluation of scientific research are:

- Impact factor
- Article citations
- Journal citations
- The number and order of the authors, etc.

Impact Factor is the number of citations of articles published in the journal during the previous 2 years divided by the total number of articles published in the journal during the same period. Factor of influence depends on: The quality of the journal, the language on which it was printed, the area it covers, and the magazine distribution system [Tables 1 and 2] [Figure 1].

Citation provides guidance to scientific work because it encourages scientists to deal with the most current research areas. So actually “terror of scientometrics indicators” organizing scientific work at the global level shapes and directs it.<sup>[7]</sup> On the citation impact: Quality of work, an understanding of the language in which the work was written, the loyalty of a group of researchers, type of work, the benefit in terms of “I quote you, and you love me,” “benefit” in terms of “I will

Table 2: The table explains where's the position of Bosnia and Herzegovina in the world today in all areas that are represented in scientific research work since the 1996-2011 years

	1996-2011
H Index	40
Documents	3.524
Citable Documents	3.436
Citations	11.353
Self Citations	1.864
Citations per Document	3,22

Table 1: H-index proposed by Jorge E. Hirsch, a physicist at UCSD, as a tool for determining the relative quality. This figure present current biomedical journals in Bosnia and Herzegovina ordered by the H-Index values in 2011

Title	SJR	H index	Total Docs. (2011)	Total Docs. (3years)	Total Refs.	Total Cites (3years)	Citable Docs. (3years)	Cites / Doc. (2years)	Ref. / Doc.
Medicinski Arhiv	0,121	10	101	281	0	69	277	0,29	0,00
Bosnian Journal of Basic Medical Sciences	0,204	7	53	221	1.120	108	212	0,56	21,13
HealthMED	0,190	5	260	280	6.329	114	279	0,44	24,34
Technics Technologies Education Management	0,193	5	161	148	2.727	74	148	0,49	16,94
International Journal of Collaborative Research on Internal Medicine and Public Health	0,196	3	43	47	1.061	21	46	0,46	24,67
Sport Science	0,186	2	36	87	680	14	87	0,17	18,89
Acta Medica Saliniana	0,101	1	34	32	580	1	27	0,04	17,06
South East European Journal of Economics and Business	0,101	1	20	39	702	0	39	0,00	35,10

not quote it because he/she is my competitor” etc. Most of the scientific articles are cited by inertia, because every scientist has a collection of articles cited whenever he/she writes about a certain topic. Others are papers that cite the man himself stood citations, whereas others because it requires a reviewer or editor, to small and self-help. Only a small portion, perhaps only every fifth or tenth article, is cited because it was supposed to. They are those whose work directly benefits the author of the information or whether there touches on problems and solutions presented.<sup>[16,17]</sup>

All persons designated as authors of the work must meet the following conditions: That significantly contributed to the planning and preparation of the article or the analysis and interpretation of results and participated in writing and correcting the article and that they agree with the final version of the text.<sup>[13]</sup> Persons who are involved in data collection or superior to researchers, but are not actively involved in the development work cannot be the authors. The editor has the right to ask the author to explain the contribution of each of them. The contribution of one author is 1, and if the article was written by several authors their contribution is 1/n. In doing so, the contribution of each of the following is half of the size of the previous one. Sequence is determined by the author’s agreement.

## CONCLUSION

Given that research in medicine can contribute to the improvement of clinical and public health practice, they should be implemented. In order to be considered as significant scientific work, it is important to be carried out according to established rules and guided steps that were presented in my article. For the question of why one scientist should carry out a research, we can provide more answers. The most important thing is that well done research work with the exact results of the scientific community provides new information about the investigated problem and the researcher personal satisfaction, ability to communicate and conduct scientific dialogue with other members of the academic community

and to create opportunities to receive critical review of those who have access to the research.

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