Principles and Ethics in Scientific Communication in Biomedicine

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Editorial ABSTRACT

Introduction and aim: To present the basic principles and standards of scientific communication and writing a paper, to indicate the importance of honesty and ethical approach to research and publication of results in scientific journals, as well as the need for continuing education in the principles and ethics in science and publication in biomedicine. **Methods:** An analysis of relevant materials and documents, sources from the internet and published literature and personal experience and observations of the author. **Results:** In the past more than 20 years there is an increasingly emphasized importance

of respecting fundamental principles and standards of scientific communication and ethical approach to research and publication of results in peer review journals. Advances in the scientific community is based on honesty and equity of researchers in conducting and publishing the results of research and to develop guidelines and policies for prevention and punishment of publishing misconduct. Today scientific communication standards and definitions of fraud in science and publishing are generally consistent, but vary considerably policies and approach to ethics education in science, prevention and penal policies for misconduct in research and publication of results in scientific journals.

Conclusion: It is necessary to further strengthen the capacity for education and research, and raising awareness about the importance and need for education about the principles of scientific communication, ethics of research and publication of results. The use of various forms of education of the scientific community, in undergraduate teaching and postgraduate master and doctoral studies, in order to create an ethical environment, is one of the most effective ways to prevent the emergence of scientific and publication dishonesty and fraud.

Key words: scientific communication, principles, ethics; IMRAD structure, scientific fraud, plagiarism, ethics education.

1. INTRODUCTION

Science as a source of knowledge is created and developed by scientific research. Like other segments of human work and activity, the scientific work can be developed only if it is based on honesty and trust, and consistent application of the best possible existing procedures in search for new knowledge and providing scientific evidence for the established assumptions and hypotheses (1, 2, 3, 4).

The long scientific hard work of several months or several years, and the research results achieved, need to be finalized with publication in a scientific journal for to be added to human knowledge and permanently presented to the scientific community for critical reasoning. Publishing of the results of scientific research in the form of a report–scientific paper is a crown and a final result of the research of each scientist. The phrase “publish or

perish” reflects the pressure in the professional and academic environment for continuous publishing of new findings and results of professional, research and academic work for verifying the status and career progression (5, 6, 7). Published scientific paper becomes lasting legacy and forever subject to review and critique.

To present and share the knowledge, skills and results of the professional scientific and academic work with the wider scientific community it is necessary to write and publish papers in the peer review scientific journals. But it is not easy and requires from a scientist sincere desire for knowledge, imagination and creativity, perseverance in the hard work and writing skills to prepare a scientific paper in accordance with internationally accepted principles and criteria in scientific communication (4, 5).

Aim of this article is to present

the basic principles and standards of scientific communication and writing a paper, to emphasize the importance of ethics and honesty in science and publishing, and to indicate the need for education and creating ethical environments in science and publishing.

2. BASIC PRINCIPLES AND STANDARDS OF SCIENTIFIC COMMUNICATION

In 1978, a group of editors of general medical journals met in Vancouver to set guidelines for manuscripts submitted to their journals. This group became known as the Vancouver Group expanded and evolved into the International Committee of Medical Journal Editors (ICMJE). ICMJE members meet annually and produced the Uniform Requirements for Manuscripts Submitted to Biomedical Journals (UR) with multiple editions, the last one from April 2010 (7, 8). They broad-

ened their concerns and included ethical principles for publishing, editorial policy, potential conflict of interest etc. UR are translated into Instructions for authors for many scientific journals. UR principles of the scientific communication are: clarity (clearly written), accuracy (accurate data), simplicity (easily accessible reports of medical studies) and understandability. Beside ethical principles related to the process of evaluating, improving, and publishing manuscripts and the relationships among editors and authors, peer reviewers, and the media, UR address the more technical aspects of manuscripts preparing and submission (7, 8).

The most common motives for someone to prepare and publish an article in a scientific journal is to have something important to say, to improve practice, to promote thought or debate, to allow examination of his/her work, as well as fame, money, career advancement, to entertain, divert, amuse and to educate. There are some essential questions each author needs to ask him/ herself before beginning to write a paper, i.e. what s/he has to say, is it worth saying, what is the right format for the message, what is the audience for the message, and where to publish the message?

Editors want and expect from the authors of submitted paper excitement and surprise of something new, importance of the issue, originality of the research data, relevance to the audience of the journal, as well as true, clearly and engagingly written (9).

Beside finding the right journal author needs to consult the journal's guidelines about journal categories, length, format of the paper and how to cite references in the list and to connect them to the text.

Authorship and contributorship is very sensitive and important issue. Authorship is about credit and responsibility because the research evaluation and academic life revolves around publication and being an author. Usually grants depend on or demand publication of the results. According to UR an "author" is generally considered to be someone who

has made substantive intellectual contributions to a published study, and biomedical authorship continues to have important academic, social, and financial implications. An author must take responsibility for at least one component of the work, should be able to identify who is responsible for each other component, and should ideally be confident in their coauthors' ability and integrity (8). Editors are strongly encouraged to develop and implement a contributorship policy, as well as a policy on identifying who is responsible for the integrity of the work as a whole. It is still unresolved question of the quantity and quality of contribution that qualify for authorship.

2.1. The basics of writing a paper of observational and experimental studies

The text of observational and experimental articles is usually divided into sections in accordance with so-called "IMRAD" structure: Introduction, Methods, Results, and Discussion. Other types of articles, such as public health articles, case reports, reviews, and editorials, probably need to be formatted differently (7, 8, 9, 10). There is a key question for each section of the IMRAD structure of the paper which an author needs to keep in mind while writing the manuscript.

Title of the paper might be indicative or informative. It should be rational and clear in order to reflect the content of the scientific research and paper.

Abstract (or summary) of the paper might be: 1) Classical form or 2) Structured abstract with subsections (aim and objective; methods describing setting, participants, design and main outcome measures; results and conclusions). Structured abstracts are preferred for original research and systematic reviews. It should emphasize new and important aspects of the study or observations. The abstract should provide the context or background for the study and should state the study's purpose, basic procedures, main findings, principal conclusions, and funding sources. Authors need accurately reflect the content of the

article in the abstract. Structured abstract helps writers to remember what to include and how to organize information. It helps readers search and read by chunking information and following a pattern. Abstract as a part of the article helps the reader to decide on reading full text paper and directs the reader to the research problem. Abstract printed separately or indexed in some databases as only portion of the paper helps the reader to find the article or replaces the article if it is not available. Abstract ends with 3-8 key words from the Medline MeSH (Medical Subject Headings) list (7, 8, 9, 10).

Introduction section, beside answering the key question needs to offer answer to some additional questions, i.e. what has been done before and why was this study needed? In fact, it is a brief systematic review like a pyramid with base up and the top down focusing to the aim and hypotheses of the study. Author needs to be sure that readers understand the importance of the study, but s/he shouldn't overdo it. S/he needs to provide only directly pertinent references, and do not include data or conclusions from the work being reported.

Methods need to be described like a recipe, clearly written how and why a study was done in a particular way, approach for creation of the study sample with inclusion and exclusion criteria and a description of the source population, randomization and ethical standards, research method and type of the study, equipment and machinery, chemicals, reliability and validity of data and results (validity test), statistical methods and procedures, computer software programs and ethics. Established standardized and published methods, including statistical methods, to be mentioned, with connecting references for further information, instead describing the methods in details. Procedures to be described in sufficient detail to allow others to reproduce the results. All information obtained during the study belongs in the "Results" section. For the informed readers this is the most important section (7, 8, 9, 10).

Results and numbers need to be presented in a logical order that readers understand best, emphasizing the main or most important findings first. The text should tell the story including basic descriptive data and everything relevant in connect to hypotheses, but avoid to discuss implications or strengths and weaknesses of the study. Beside derivatives (for example, percentages, “p” values etc.) the numeric results need to be presented with absolute numbers from which the derivatives were calculated, and to specify the statistical methods used to analyze them. The most important results need to be emphasized and summarized (7, 8, 9, 10).

Discussion starts with overall finding and meaning of the study, mechanisms and implications particularly for clinical practice, health policy and future research. There is no need to repeat in detail data or other information given in the Introduction or the Results section. Beside statement of the principal findings and the new and important aspects of the study, strengths and weaknesses with limitations of the study need to be presented in relation to other studies, discussing particularly any differences in results (7, 8, 9, 10).

Conclusions need to be connected with the objectives and goals of the study and to point out unanswered questions and need for the future research with possible stating new hypotheses. Style of discussion needs to use short words, sentences and paragraphs, without jargon, abbreviations, figures of speech, idioms and clichés, preferring Anglo Saxon over the Latin, nouns and verbs to adjectives and adverbs, active to passive, concrete to the abstract, as well as to be rational and to avoid being chatty, author to be pleased with him/herself (7, 8, 9, 10).

References need to be carefully selected by relevance to the text of the paper from those really read. References are numbered consecutively in order of appearance in the text and identified by Arabic numerals in parentheses (1), square brackets [1], superscript¹, or a combination^[1]. At the end of the article the full list of ref-

erences should follow the Vancouver style according to BMJ recommendation (7, 8, 9, 10).

Tables and figures should add information by saving space and reducing the length of the text, but without overlapping. Each table or figure should be self-explanatory and not overloaded with numbers or ink (bold). The tables give the evidence (max 5-6) and figures illustrate the highlights (max 3-4). Tables also provide information at any desired level of detail and precision. Graphs need to be alternative to tables with many entries without duplicating data in graphs and tables. Figures should be suitable for printing and to meet their own quality standards. Comments of tables and figures need to emphasize or summarize only the most important observations (7, 8, 9, 10).

2.2. The basics of writing a paper of public health programs and practice

Papers related to public health programs and practice might have different than IMRAD structure. Anyhow, the paper should be written in logical order consisting informative or indicative title, an introductory section with description of the subject or public health problem and objectives, the current status or situation, recommended or realized program and activities, lessons learned, experiences, results and recommendations, and finally conclusions and a list of references. Special importance and validity have papers which describe new practice, approach and activities, have clear description, design of the practice, approach and activities, offers possibilities for implementation of the practice, approach and activities in other settings and environments, presents the experiences gained, lessons learned and recommendations (10).

The basics of writing a paper also include structuring of the text of the paper even if not in form, references to be kept to the essentials, and paying attention to the authorship, acknowledgements, competing and conflict of interest. Author needs to find the right journal selecting it because of the audience and not be-

cause of its impact factor or its “reputation”.

3. IMPORTANCE OF HONESTY AND ETHICAL APPROACH TO SCIENCE AND PUBLISHING

Social norms and the importance of the activities of scientists require full dedication and honesty in research and writing papers. The public, scientific and general, expect honesty and fairness from the scientist, because those features give meaning and sense to the science and its essence (2, 5, 11).

Scientific papers are available at most electronic databases that provide easy access and exchange of information, and use the results as the most important form of cooperation in the field of science. Electronic databases and so called secondary publications, which contain references/papers, for example the Directory of Open Access Journals (DOAJ), Current Contents (CC), Medline, Web of Science (WOS), allow quick and easy retrieval and finding of relevant scientific sources and published research papers using keywords. The scientific contents which are not available and accessible in electronic databases are invisible and unrecognizable to the general scientific community (2, 7, 12, 13).

The importance of biomedical research and their potential direct impact on the human lives and health emphasizes the need for honesty in the work of scientists, and fully comply with all principles of research integrity. Total science is cumulative and belongs to all mankind, and every scientific discovery complements and builds it. Science is the true source of knowledge (discoveries) for humanity and contributes to the overall well-being, security in everyday life and quality of life in general (14, 15, 16).

Today, perhaps more than ever, scientific research and reports strongly attract public attention. The rapid development of technology and media enabling rapid application of scientific discoveries in everyday life, and in areas such as biomedicine has a direct impact on the health and life of humans (1-3). Although much research, especially basic, may not

find direct application in everyday life, but will be the basis on which to build and which will encourage new research and results that will have a direct impact on everyday life. It is therefore very important in the scientific work, which is the basis of science itself, integrity and honesty (2, 3, 6, 7). The development of evidence-based medicine (EBM), which is based on the collection and processing of the results of scientific research in medicine, the credibility and reliability of scientific papers is of utmost importance. Detailed review of published scientific papers and their consolidation results in guidelines for good clinical practice based on scientific evidence (15). Fraud and false results have undermine confidence in science and scientific research, researchers and institutions, and can directly negative impact on health policy, clinical and public health practice, judicial decisions and future research, as well as to the health and life of humans (1, 2, 3, 15). Undermined confidence can hinder the adoption of valuable scientific information and create resistance among the public to support budgetary expenditures in science (1).

4. INCREASED VIGILANCE TO DETECT FRAUD IN SCIENCE AND PUBLISHING

Scientific publications are deposited in the permanent bases of textual data, as opposed to thieves who steal and disappear, wicked scientist forever leave traces and opportunity to check his work. When the wicked scientist will be revealed, the truth of all his papers and results is questionable, s/he lost the respect and trust and can be excluded from the scientific community (3, 13, 14, 17). With the development of science and increase the number of scientists and scientific publications have increased the number of scientific fraud and abuse. In the early 1980s, the issue of scientific fraud became public, especially with the discovery of more cases of scientific fraud in the U.S. and other countries. By the 1980s it was believed that the emergence of scientific misconduct is an internal issue of the scientific and

academic institutions. But with the increasing role and impact of science in society, particularly in the area of biomedicine, the issue becomes public. In 1992, the U.S. established the Office of Research Integrity (ORI), with the task of promoting scientific research integrity and honesty, establishing criteria for good research practice, develop recommendations and guidelines for education in scientific integrity and honesty, and to conduct procedures and charges for checked misconduct and violations in scientific work in biomedicine (3, 6, 13, 18). Following the example of ORI, many countries have established national bodies for ethics in science. In R. Macedonia, the Law on Scientific Research was adopted in June 2012, and the Government appointed Committee of ethics with 9 members, tasked with monitoring and evaluating the application of ethical principles and values in scientific research, protection of human integrity in scientific research and ethics in business relations between entities to perform scientific research. (19).

According to Article 54 of the Law on Scientific Research, Ministry of Education and Science of the Republic of Macedonia, in August 2012, submitted a notice to all universities and higher educational institutions in the country with commitment of mentors, which derives from the law, that doctoral, master's and specialist papers must be entered in the database for checking plagiarism, and get a report from the database, at least 30 days before the public presentation/ defense of the final master report and seminar/ graduate papers at least 10 days prior to the assessment/ defense. The Base for checking plagiarism is set and available on the website of the Ministry of Education and Science of R. Macedonia (<http://plagijati.mon.gov.mk/plagiarism>) and contains information about the author and title of the paper and of the high-educational institution where the author/ student is enrolled.

Moreover, some scientific journals appointed editors for scientific integrity, as is the case with the Croatian Medical Journal (20). The edi-

tors of world renowned journals in different scientific areas formed the Committee on Publication Ethics (COPE), which in addition to promoting scientific integrity provides guidance and suggestions of editors and scholars of the procedure in case of suspected fraudulent procedures published studies and papers accepted for publication (21).

In order to prevent and detect dishonesty in science it is necessary to observe and discover various forms of scientific misconduct, but also to draw attention and to educate scientists and students to avoid doing wrong actions due to ignorance (18). The academic community is an integral part of the scientific community, and in the course of the academic training of students, in addition to acquiring knowledge and skills, adopt patterns of behavior of their teachers and mentors. Furthermore, honesty in science is strongly culturally conditioned by the environment in which scientists live and work (13). It should be emphasized that scientists should highlight and promote the highest ethical standards as the only acceptable because in them lies their work, the confidence of the community and its welfare.

5. THE MAIN FORMS OF SCIENTIFIC AND PUBLISHING MISCONDUCT

Academic scientific community values and rewards the highest those with the richest professional resume (CV) and the largest number of published scientific papers. Due to constant pressure in academia to generate extensive scientific production, scientists often resort to unethical behavior in research and publication of results. Any dishonesty and ethical violations in science, regardless of the reasons why it was done, unintentionally due to ignorance or deliberately, reduces and devalues science, thus providing an undeserved benefit to the authors (3, 22).

There are three major and most severe forms of scientific fraud, scientific and publishing dishonesty or misconduct, in proposing, conducting or evaluation of research and presentation of the research results (3, 7, 11, 14, 18, 22, 23, 24, 25):

- Inventing data and results (fabrication);
- Alteration or changing the results (falsification); and
- Plagiarism (plagiarism), including self-plagiarism (self-plagiarism), fragmented, repetitive and double publication (duplicate publication).

Besides these, there are a number of other kinds of misconduct that scientists should know how to recognize and avoid, i.e. "pathology" of authorship, conflict of interest, conflicts of loyalty, "pathological" science etc.. (3, 6, 14, 22).

In the process of publishing scientific papers it is important to know how a completed research should be described in a scientific paper.

Vedran Katavic, editor of the scientific integrity of Croatian Medical Journal, explains in the five-year report on the research integrity that authors are often not aware of some forms of scientific misconduct, and the reason for this lies in their inadequate education (20).

Papers that succeed to pass the review process and are published in two or more magazines or papers deemed for plagiarism, as a rule, they are withdrawn from publication (retraction), and that leaves an indelible shadow on the reputation of the author (6, 18, 26).

National Library of Medicine (NLM) in the United States announced that in the Medline database, in 2006, 607 texts of papers by the first check were marked as double published papers (there are about 16 million papers published annually). Papers marked as plagiarism, self-plagiarism and double published papers are not acceptable in the scientific community. Such works have no meaning, and spend valuable time of editors, reviewers and readers. Scientists who resort to such practices gain undeserved profits and leave the wrong impression of high scientific productivity (3, 14).

Scientists and authors, reviewers and editors of scientific journals should fight together against unethical research that are inconsistent with the scientific idea and are detrimental to the scientific community and society. They need critically

to read and review the scientific literature, to report on plagiarism and other questionable procedures in research to editorial boards of journals and relevant bodies in faculties and/or universities and relevant ministries. It is important to recognize plagiarism and to teach the academic community at all levels of education (5, 7, 27, 28, 29, 30). The number of retracted articles from the magazines in which they were published is with rapid increase in the last 10 years. In the period from 1928-2011, in a total of 42 investigated databases in all fields of science, were withdrawn 4449 published papers (31). However, due to difficulties in detecting unethical behavior in research and publishing, discovered and reported scientific fraud, with the withdrawal of published scientific papers, show just only the "tip of the great iceberg" hidden below the water surface (26, 27, 30, 32).

6. CONCLUSION

Honesty in science is the foundation of its existence. Ethics of science is difficult to describe and summarized to define. Everything in the scientific work should be done honestly and objectively, to suppress the own vanity and desire for undeserved personal gain and selfish display, to be honest in conclusions, fair and equitable to associates, to be consistent in accuracy and never to change or fabricate the data, not to attain intellectual property from any other, no matter how it may seem irrelevant. Plagiarism and self-plagiarism are dishonest and harmful actions of unauthorized taking intellectual property, which the author gives undeserved profits, reduce scientific creativity and do not contribute to science and society. Even the slightest shadow of violation of scientific honesty with misconduct in scientific work completely devalues the work and leads to irreversible loss of reputation. Even the smallest achievement in science is an important part in the vast mosaic of scientific knowledge, but only if it is done sincerely and honestly. Every scientist, even one whose scientific work is a small part of his daily routine work, should approach the work with a pure heart

and an open mind. Researchers and authors, professional associations, reviewers and editors of scientific journals are responsible for continuously monitoring and establishing high ethical standards. They can take advantage of information technology in order to interconnection and creating an environment for discussion to raise awareness and continuous education of the scientific community on ethical issues in conducting research and scientific publication. Supervision over the scientific literature with repeated use of software technology for detection and reporting of unethical conduct, fraud and plagiarism to the committee of ethics of the academic institution or the competent state institutions and bodies is one of the important steps to promote scientific and publishing honesty and integrity.

REFERENCES

1. Ferris L. Scientific Misconduct and International Communities. In: Carmi A, Ferris L, Nachshon D, eds. *Medicine and law - Theme issue on scientific misconduct*. World Association for Medical Law. *Medicine and Law*. 2007; 26(3): 3-5.
2. Marusic M. Science and scientific research. In: Marusic M. (ed.) *Principles of research in medicine*. Medicinska naklada, Zagreb, 2008: 1-26.
3. Bilic-Zulle L. Znanstvena cestitost i temelj postojanja i razvoja znanosti. *Biochemia Medica*. 2007; 17: 143-150.
4. Donev D. Scientific and Publication Ethics and Misconduct. (In Macedonian). *Vox Medici*, Dec 2012; 77: 235-240. Available at: <http://www.lkm.org.mk/VoxMedici/77.pdf>.
5. Hwang K. How to Write a Scientific Paper: Three Tips to Remember. *Arch Plast Surg*. 2012 January; 39(1): 77. Available from: <http://europepmc.org/articles/PMC3385294/pdf/aps-39-77A.pdf> Accessed: June 30, 2013.
6. Bazdaric K, Pupovac V, Bilic-Zulle L, Petroveckii M. Plagiarism as a violation of scientific and academic integrity. *Medicina*. 2009; 45(2): 108-117.
7. Masic I, Kujundzic E. Science editing in Biomedicine and Humanities. *Avicena*, Sarajevo, 2013: 278.
8. International Committee of Medical

- Journal Editors (ICMJE). Uniform Requirements for Manuscripts Submitted to Biomedical Journals. Available from: <http://www.icmje.org/> Accessed: June 12, 2013.
9. Marusic A, Marusic M. Teaching students how to read and write science: a mandatory course on scientific research and communication in medicine. *Acad Med*. 2003; 78: 1235-1239.
 10. Donev D. Introduction to the Medicine Textbook for students at the Faculty of Medicine in Skopje [In Macedonian]. Faculty of Medicine, University Ss Cyril and Methodius in Skopje, 2013. In press.
 11. Benos DJ, Fabres J, Farmer J, Gutierrez JP, Henessy K, Kosek D. et al. Ethics and scientific publication. *Adv Physiol Educ* 2005; 29: 59-74.
 12. Broga M, Mijaljica G, Waligora M, Keis A, Marusic A. Publication Ethics in Biomedical Journals from Countries in Central and Eastern Europe. *Academia.edu*, Jan 2013. Available from: http://www.academia.edu/2764566/Publication_Ethics_in_Biomedical_Journals_from_Countries_in_Central_and_Eastern_Europe Accessed: Aug 14, 2013.
 13. Petroveckii M, Scheetz MD. Croatian Medical Journal introduces culture, control, and the study of research integrity. *Croat Med J*. 2001; 42: 7-13. Available from: <http://www.cmj.hr/2001/42/1/11172649.htm> Accessed: July 18, 2013.
 14. Katavic V. Responsible conduct of research. In: Marusic M. (ed.) *Principles of research in medicine*. Zagreb: Medicinska naklada, 2008: 234-245.
 15. Joanna Polanin-Huk J, Huk J, Filip R. Fraud and misconduct in clinical research. *Journal of Pre-Clinical and Clinical Research*, 2010; 4(2): 158-160.
 16. Masic I. Ethical Aspects and Dilemmas of Preparing, Writing and Publishing of the Scientific Papers in the Biomedical Journals. *Acta Inform Med*. 2012; 20(3): 141-148.
 17. Bilic-Zulle L, Frkovic V, Turk T, Azman J, Petroveckii M. Prevalence of plagiarism among medical students. *Croat Med J*. 2005; 45: 126-131.
 18. The Office of Research Integrity. Annual Report 2010. Available from: http://ori.hhs.gov/images/ddblock/ori_annual_report_2010.pdf Accessed: Jul 18, 2013.
 19. Влада на Република Македонија. Закон за научно-истражувачката дејност. „Службен весник на Република Македонија“ бр. 46/2008; 103/2008; 24/2011 и 80/2012). Достапно на: <http://www.mon.gov.mk/images/pdf/Zakon%20za%20nauchno-istravachkata%20dejnost.pdf> Пристапено на: Jul 20, 2013.
 20. Katavic V. Five year report of Croatian Medical Journal's research integrity editor – policy, policing, or policing policy. *Croat Med J*. 2006; 47: 220-227.
 21. Committee on Publication Ethics. Promoting integrity in research publication. Available from: <http://publicationethics.org/> Accessed: Jul 20, 2013.
 22. Trajkovski V. Ethics in publishing scientific papers. [In Macedonian]. *Godisen zbornik na Filozofski-ot fakultet, Univerzitet "Sv. Kiril i Metodij"*, Skopje, 2011: 453-67.
 23. Sanjeev H. Plagiarism and publication ethics: Does and don'ts. *Indian Journal of Dermatology, Venereology and Leprology*, July-August, 2008; 74(4): 301-303. Available from: <http://www.bioline.org.br/request?dvo8146> Accessed: Jul 18, 2013.
 24. Trajkovski V. Plagiarism in the scientific research. [In Macedonian]. *Godisen zbornik na Filozofski-ot fakultet, Univerzitet "Sv. Kiril i Metodij"*, Skopje, 2012: 262-273.
 25. Masic I. Plagiarism in Scientific Publishing. *Acta Inform Med*. 2012; 20(4): 208-213.
 26. Grieneisen ML, Zhang M. A Comprehensive Survey of Retracted Articles from the Scholarly Literature. *PLoS ONE* 2012; 7(10): e44118. doi: 10.1371/journal.pone.0044118. Available from: <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0044118> Accessed: Jul 19, 2013.
 27. Mojon-Azzi SM, Mojon DS. Scientific misconduct: from salami slicing to data fabrication. *Ophthalmic Res*. 2004; 36(1): 1-3. Available from: <http://content.karger.com/produktedb/produkte.asp?typ=pdf&file=ORE2004036001001> Accessed: Jul 24, 2013.
 28. Nath SB, Marcus SC, Druss BG. Retraction in the research literature: misconduct or mistakes? *Med J Aust* 2006; 185: 152-154. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/16893357> Accessed: Jul 19, 2013.
 29. Wager E. What do journal editors do when they suspect scientific misconduct? In: Carmi A, Ferris L, Nachshon D, eds. *Medicine and law—Theme issue on scientific misconduct*. World Association for Medical Law. *Medicine and Law*. 2007; 26(3): 535-544.
 30. Scheetz M. The Teaching Scholars Program: a proposed approach for promoting research integrity. In: Carmi A, Ferris L, Nachshon D, eds. *Medicine and law—Theme issue on scientific misconduct*. World Association for Medical Law. *Medicine and Law*. 2007; 26(3): 599-614.
 31. Marusic A, Katavic V, Marusic M. Role of editors and journals in detecting and preventing scientific misconduct: strengths, weaknesses, opportunities, and threats. In: Carmi A, Ferris L, Nachshon D, eds. *Medicine and law—Theme issue on scientific misconduct*. World Association for Medical Law. *Medicine and Law*. 2007; 26(3): 545-566.
 32. Neill US. Publish or perish, but at what cost? *J Clin Invest*. 2008; 118: 2368.