

REVIEW ARTICLE

Ethics in research and publication of research articles

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Abstract

Science aims at promoting knowledge by gathering and discovering the objective truth, the facts that are independent of human interests, their values, ideology and biases. The way in which scientists come to this goal is through the universally accepted and thoroughly regulated processes – the *scientific method*. There is no clear definition which will answer the question what is unethical in biomedical research. All people recognize some common ethical norms but different individuals interpret, apply, and balance these norms in different ways in light of their own values and life experiences. Generally, it can be said that unethical behaviour in science is any significant mistreatment of intellectual property or participation of other parties, deliberately hampering the research process or distortion of scientific evidence, as well as all the behaviours that affect the integrity of scientific practice. Given the importance of the primary goal of scientific enterprise, that is search for truth and trustworthy results, ethics in science has increasingly come into focus. There are several reasons why it is important to adhere to ethical norms in research. Norms promote the aims of research, such as knowledge and truth, variety of moral and social values and help to build public support for research.

This paper analyzes the major principles of ethical conduct in science and closely related topics on ghost authorship, conflict of interest, co-authorship assignment, redundant/repetitive and duplicate publications. Furthermore, the paper provides an insight into the fabrication and falsification of data, as the most common forms of scientific fraud.

Keywords: conflict of interest, ethics, fabrication and falsification of data, ghost authorship, publication, redundant and duplicate publication, research.

Conflict of interest: none.

Ethics in science and scientific research

Science aims at promoting knowledge by gathering and discovering the objective truth, the facts that are independent of human interests, their values, ideology and biases. The way in which scientists come to this goal is through the universally accepted and thoroughly regulated processes – the *scientific method* (1-8). Every step of this method, if implemented correctly and truthfully, helps to reach objective goals, with significant contribution to the welfare of the society as a whole (1).

There is no clear definition which will answer the question what is unethical in biomedical research. All people recognize some common ethical norms but different individuals interpret, apply, and balance these norms in different ways in light of their own values and life experiences. Generally, it can be said that unethical behaviour in science is any significant mistreatment of intellectual property or participation of other parties, deliberately hampering the research process or distortion of scientific evidence, as well as all the behaviours that affect the integrity of scientific practice. In 2000, in the United States, fraud in scientific research was defined as fabrication, falsifying and plagiarism in the process of proposing, conducting and publishing the results (1). The Nordic countries proposed a much broader definition of fraud in scientific research describing it as “*any degree of dishonesty*”.

Given the importance of the primary goal of scientific enterprise, search for truth and trustworthy results, ethics in science has increasingly come into focus. William Lipscomb, 1976 Nobel-Prize-winner in chemistry, states that: “*I no longer put my most original ideas in my research proposals, which are read by many referees and officials. I hold back anything that another investigator might hop on and carry out. When I was starting out, people respected each-other’s research more than they do today, and there was less stealing of ideas*”.

The following is a general summary of some ethical principles in scientific research and publication: honesty, objectivity, integrity, carefulness, openness, respect for intellectual property, confidentiality, responsible publication, responsible mentoring, respect for colleagues, social responsibility, non-discrimination, competence, legality, animal care, and human subjects’ protection. There are several reasons why it is important to adhere to ethical norms in research. Norms promote the aims of research, such as knowledge and truth, variety of moral and social values and help to build public support for research.

Whatever the definition be, there are numerous examples of unethical behaviour in biomedical research which include (1):

- Bringing patients at risk (inadequate study design, inadequate supervision of the research, ignoring side effects or inadequate implementation of the protocol of the study);
- Participation in fraud;
- Creation or falsification of scientific results;
- Falsification of consent letters;
- Plagiarism.

There is no single solution that would allow full ethics in scientific research. Studies show that the misconduct is directly related to the following factors (1):

- Increased academic expectations and greater desire for publishing papers;
- Personal ambition, vanity and desire for fame;
- Predilection;
- Greed, which is directly linked to the financial gain;
- Lack of moral capacity to distinguish the right from the wrong.

In regard to the above listed values of the characteristic of many of us is to be expected that the behaviour that we are talking about can only be more pronounced over time and, as such, it may leave many consequences to science in general. It is therefore very important to take preventive measures that will greatly limit the implementation of these unethical measures. As a rule of thumb, the following preventive measures should be undertaken:

- Make ethical standards very clear to all researchers;
- Provide education and training for all researchers;
- Clearly identify methods of sanctioning such behaviour;
- Introduce stricter control of sponsored research.

Forms of unethical behaviour in biomedical articles

The various forms of unethical behaviour in publishing of the results of scientific research are described in the vast scientific literature (1). The most frequent types include: redundant publications (24%), animal welfare concerns (16%), duplicate publications (15%), authors' disputes (14%), data fabrication (8%), human welfare concerns (8%), plagiarism (7%), conflict of interest (5%), other forms including reviewer bias, or submission irregularities (3%).

Ghost authorship

Ghost authorship occurs when an individual who has significantly contributed to and participated in the development of a specific scientific work is not mentioned as an author. A special form of ghost authorship is a publication from an "invisible" author by the request of industry, where the credibility of results is questionable on account of the conflict of interest. An example is a situation where influential pharmaceutical industry or any other party can offer the benefit, employs professional writers or agencies to produce an article that will later be attributed to a certain recognized scientific researcher.

Example from practice:

- *Redux case:* Medications dexfenfluramine and phentermine (fen-phen) are drugs that have been prescribed for the simultaneous use in the treatment of excess weight until 1997 when it was found that the application of phentermine leads to primary pulmonary hypertension and heart valve damage. In May 1999, it was revealed that Wyeth-Ayerst Laboratories, a company that produces dexfenfluramine (Redux), hired ghost authors to write the results of research on this drug but the results were published under the names of prominent researchers. Also, during this period the company had participated in the destruction of data concerning the negative effects of the drug, which were published in medical journals.

Ghost authorship raises many ethical questions:

- *Conflict of interest:* Conflict of interest is a serious problem. Evidence-based medicine requires that clinical decisions are based on clear empirical evidences published in medical journals which are regularly audited. If clinicians base their decisions on such inadequate research results, it can have serious negative consequences for patients. For example, a certain medication that may not be the best drug of choice for a particular disease or patient but, for example, is strongly promoted by an influential expert in a reputable medical journal. In this way, patients may receive suboptimal treatment.
- *Academic integrity:* Authorship in certain research papers is often described as academic currency. Employment, wages and reputation in academic circles is largely related to the number, quality and frequency of publication of research papers, and regularly is considered as a valid indicator of one's work and abilities. In the case of

ghost authorship, when often a particular author is hired for a specific publication, which was actually written by another person, this publication is no longer an adequate measure of his/her work. Furthermore, ghost authorship separates the author from the responsibility. Universally accepted, an individual or group of authors are considered responsible for the information presented to the public. Knowing that they will be held responsible for their results presented in the paper, the researchers are trying to implement all the measures to better prepare the work before its publication. Therefore, if a person is listed as an author, but did not contribute to any stage of work or research project, his/her responsibility is questioned.

The International Committee of Medical Journal Editors has clearly published guides in which the author of a scientific paper must take an active participation in its preparation and publication, and accepts responsibility for its content. Hence, assigning co-authorship must be based on a significant contribution to the work, either in the feasibility study, analysis, interpretation, editing facilities, revision, and approval of the final version, as well as publication of the study.

Redundant / repetitive publication

It is considered as a special form of plagiarism. Redundant/repetitive publication is defined as the publication of copyright material with the addition of new, unpublished data. Thus, this is a form of un-ethics in science, where part or parts of already published article, but not the complete article, are published again. There are several reasons why this form of publishing is unethical. First, it undermines the international copyrights. Second, duplication of data with new data consumes the (valuable) time of peer-reviewers. Third, it leads to unnecessary expansion of already huge amount of published literature. Fourth, it leads to inadequate highlighting of certain information. This may also lead to potential interferences with subsequent meta-analysis.

Committee on Publication Ethics (COPE) proposes several recommendations concerning repetitive publications (1):

- Already published studies should not be republished if they do not further support the actual study;
- Repeated publication of an article that has been published in another language is allowed only when is clearly stated the original source;
- At the time of the article submission, the authors must submit the materials that are used in their article.

Therefore, the basis is that authors should not attempt to publish information that is already published in other articles. If authors consider that the already published data are of utmost importance for their study, then they should repeat the study or parts of the research, and use these data in the new publication.

Duplicate publication

It is defined as a publication of an article which is identical or largely overlaps with the article already published, with or without acknowledgments. Two articles share the same hypothesis, results and conclusions. Why scientists try to republish the same article? One reason is their perception that if someone wants to survive in the highly competitive field of science, one must create voluminous curriculum vitae. This is true in certain situations, especially subsequently when the number of articles rather than their quality, are largely valued as a factor in promotion and academic progress. Another, perhaps more justifiable reason for resorting to such unethical behaviour, lies in the fact that the authors sometimes try to reach the readers who are not so familiar with the journals in which the first article was already

published, especially if the article was published in another language, such as for example the Chinese language which is relatively inaccessible. However, authors must have the consent of both journals before they decide to republish a certain article.

Duplicate publication is considered unethical for several reasons (4,5). The first is that, in an inadequate manner, the authors attempt to increase the scope of their own published works. Another important reason is that the article has the potential to change the image of documents. For example, if the results were taken into account twice or even more in a meta-analysis conducted to outline some best practices, the results would not be valid. This was the case of a study including all the published papers in which authors investigated the effect of the drug ondansetron on postoperative vomiting. It was observed that 17% of the published papers were duplicates, of which 28% of the patient data were duplicated. This led to a situation in which the efficacy of this drug was overestimated by 23%. This example points out the danger of duplication of publications by scientists who have conducted research, especially when making conclusions about the efficacy and safety of a certain drug.

Good practice in publishing scientific work requires that authors can submit drafts of their work only to one journal at a given moment. Authors may choose to re-propose to the same or another journal a revised version of the scientific work only when the first application receives negative answer on its publication. Regardless of these considerations, duplicate papers still occur and as such continue to be a significant problem across scientific journals. With the increasing availability of computerized medical databases such as PubMed, it becomes increasingly difficult for scientists to duplicate the previously published works. When the duplicated article is detected and reported by the reviewer, the journal rejects the proposed work or withdraws the article if it is already published. A statement on duplication is published in PubMed, which can have serious consequences for the author's reputation.

Conflict of interest

In the research and publication of scientific papers it is vital to ensure objectivity in order to preserve the integrity of the research, the reputation of the institution and the journals which published the study. From the author that conducted a study, it is expected to objectively present the results of the research, whereas from the reviewers it is expected to evaluate these results objectively. When experts at prominent positions get into a conflict of interest, it results in a biased or a poor decision-making; hence, the information that reaches the scientific circles and the readers in general can be modified and can be potentially devastating.

Conflict of interest may be individual or institutional. Recognizing the potential conflict of interest is usually simple, but sometimes it can be a challenge to determine whether a conflict exists or not, if it is not communicated. This is serious, because everything which is not transparent can be interpreted as a bias or corruption. Therefore, authors must clearly highlight potential conflicts, so as they can be treated appropriately.

Since 1995, the National Institute of Health (NIH) has decided to terminate a number of restrictions that had previously existed in terms of external cooperation, all in order to get the renowned scientists from different fields. This means the abolition of limits on the amount of articles that scientists can publish, or the time that can be spent on work outside the institute, as long as it does not affect their current job. Yet, it is very important for all scientists to clearly specify each source of income beside their regular employment.

However, it turned out that the big problem is the cooperation with pharmaceutical and biotech companies, and many experts share the opinion that such cooperation should be terminated. This also led the *New England Journal of Medicine* to ban the authors to write review articles if they had a financial interest in the company concerning the research.

However, in recent years it is increasingly difficult to identify authors who are completely independent of the industry.

Financial interest means everything from salaries or other income, interest in shares and intellectual property (patents, copyrights, etc.).

Authorship

Being the author of a scientific paper is a privilege and a great academic satisfaction. Not only that authorship contributes to science in general, but it also brings respect and reputation and also serves as a measure for the promotion and advancement. However, this seems only a part of the author's equation. Another aspect is that authorship entails a great responsibility. Every scientist has its own vision of what it takes to become the author. But often, among the authors of a project, these visions are different. Personal conflicts and turmoil can often lead to disagreements on the issue of whom belongs the authorship. There are some guides, issued by the NIH, that define the authorship. In a broad sense, the author is any person who has significant intellectual contribution to a particular study. The International Committee of Medical Journal Editors (ICMJE) is a recognized organization dealing with ethical issues in biomedical research, and defines authorship as follows (1):

- a) Significant contribution to the concept, design, collection, analysis and interpretation of the study;
- b) Writing study template or revision in terms of intellectual content;
- c) Final approval of the version which will be sent for publication.

The author needs to meet "a", "b" and "c" criteria. Also, the first author should coordinate the study, and should respect all the rules of the study results submission. In addition, he/she should be responsible for communicating with the editors and the reviewers of the scientific journals.

Fabrication and falsification of data

Fabrication and falsification of data represents half of all cases reported as a form of unethical behaviour. Falsification of data includes its creation, selective publication of results (e.g. those corresponding to the study goals) and the omission of conflicting data, as well as the conscious exclusion or modification of data. This can include everything from the rejection of unwanted pieces of information to their unfounded creation.

This is unethical for several reasons (1,2):

- It affects the integrity of other studies, also the authors which are their creators and other authors in the same field of science;
- If such article is not discovered on time, the other authors lose their energy and time in vain trying to take advantage of the presented results in their studies;
- Creates a negative image of science in general and affects the general trust.

The problem of this kind of behaviour is particularly evident in clinical studies and may have negative consequences for the patients. For a scientist who carries out a study concerning a potential new treatment or management of a disease, the impact on the patient can be fatal or at the very least psychologically devastating, if the crucial information is false or deleted. The number of such papers containing falsified or fabricated data is increasing. Therefore, each author must faithfully and accurately collect, present and publish the experimental data.

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