



RESEARCH

Scientific integrity in the education of health professionals

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Abstract

The lack of ethical and methodological rigor in the academic environment demonstrates the need for changes in health education in order to reestablish good scientific practices. This research was motivated by the lack of Brazilian articles that relate the promotion of scientific integrity to the training of health professionals through the analysis of curricular guidelines and codes of professional ethics. Thus, the curricular guidelines and codes of ethics of six fields of health sciences were analyzed: medicine, nursing, pharmacy, nutrition, dentistry and biomedicine. For that, a documentary and descriptive research was carried out. From this, it was observed that in general, both the curricular guidelines and the codes do not include the descriptors selected in the DeCS regarding scientific integrity, scientific dissemination, research promotion, plagiarism and data manipulation.

Keywords: Health education. Codes of ethics. Methods. Ethics, research. Bioethical issues. Human experimentation. Bioethics.

Resumo

Integridade científica na educação de profissionais de saúde

A falta de rigor ético e metodológico no meio acadêmico evidencia a necessidade de mudanças na educação em saúde a fim de restabelecer boas práticas científicas. Esta pesquisa foi motivada pela carência de artigos brasileiros que relacionem a promoção da integridade científica à formação dos profissionais de saúde por meio da análise de diretrizes curriculares e códigos de ética profissional. Assim, foram analisadas as diretrizes curriculares e os códigos de ética de seis áreas de ciências da saúde: medicina, enfermagem, farmácia, nutrição, odontologia e biomedicina. Observou-se que, de modo geral, tanto as diretrizes quanto os códigos não contemplam termos relacionados à integridade científica, divulgação científica, estímulo à pesquisa, plágio e manipulação de dados.

Palavras-chave: Educação em saúde. Códigos de ética. Métodos. Ética em pesquisa. Temas bioéticos. Experimentação humana. Bioética.

Resumen

La integridad científica en la educación de profesionales de la salud

La falta de rigor ético y metodológico en el medio académico evidencia la necesidad de cambios en la educación en salud con el fin de reestablecer las buenas prácticas científicas. Esta investigación estuvo motivada por la carencia de artículos brasileños que relacionen la promoción de la integridad científica con la formación de los profesionales de salud a través del análisis de las directrices curriculares y de los códigos de ética profesional. Así, se analizaron las directrices curriculares y los códigos de ética de seis áreas de ciencias de la salud: medicina, enfermería, farmacia, nutrición, odontología y biomedicina. Se observó que, de modo general, tanto las directrices como los códigos no contemplan los términos relacionados con la integridad científica, la divulgación científica, el estímulo a la investigación, el plagio y la manipulación de datos.

Palabras clave: Educación en salud. Códigos de ética. Métodos. Ética en investigación. Discusiones bioéticas. Experimentación humana. Bioética.

Declararam não haver conflito de interesse.

Scientific integrity is understood as compliance with ethical and legal principles for the design, conduct and publication of research. These are aspects such as the search for impartiality during the development of the research, the legitimacy of data and results obtained, the correct establishment of authorship and co-authorship, as well as respect for copyright norms ¹.

The concept of education of health professionals should go beyond the technical and scientific domain of the area, including socially relevant interests related to population health and ethics in work practices and research development. The Ministry of Health ², through the Departamento de Gestão da Educação na Saúde (Department of Health Professionals Education Management), participates in the proposal of projects with repercussions on education of health professionals and its sector management, so that the education of professionals includes academic-scientific, ethical and humanistic education for technical-professional performance ³.

Research ethics should be part of this context and should take account of scientific integrity. The path of access to knowledge should not be dissociated from such integrity, since the set of ethical duties that are part of the researcher's daily life must consider the moral and ethical values of society, preserving the rights of research subjects ¹.

Recent technological tools facilitate fraud and falsification practices that have been so frequent as to banalise academic dishonesty ⁴. This is noticeable in cases of plagiarism, data manipulation, misrepresentation of authorship and other problems that reduce the reliability of the publications ⁵. In addition, due to the large number of works that do not present scientific integrity, research ethics has been a relevant topic in the international scenario of academic publishing.

Concern over the integrity of scientific data has increased since the 1980s, especially in the United States, where forged studies and falsified data have negatively affected the scientific community. These events encouraged the US government to invest in quality control of scientific research in the country through the Office of Research Integrity, a US Government agency responsible for overseeing government-supported research and investigating research misconduct ⁶.

Even with continued government oversight, there are still cases that neglect scientific integrity in the United States. There are known cases of drug registration based on manipulated data that contribute to undermine the credibility of the

scientific community in general, and more specifically the reliability of researchers involved in conflicts of interest with pharmaceutical industries. An example is the situation where the researcher has access to the data of his or her research, but does not hold the legal rights to them because, for contractual reasons, the information belongs to the transnational pharmaceutical industry which has the right to use the data for any intended purpose they see fit ⁷.

Since the 2000s, this concern has increased in other countries, such as China, where several researched authors in the academic world slipped on ethics. There was a significant increase in investment in scientific and technological research in China during the 1980s, but cases of fully copied scientific articles caused growing concern about ethics among students and scientists by the end of the 1990s. This motivated the Chinese government to investigate research that it financed, finding misconduct in at least 60% of the cases ⁸.

Some countries took a little longer to get involved in this discussion that marked the international scenario of scientific publishing. In Brazil, research ethics was the subject of recent conferences in 2010, 2012 and 2014, at the 1st, 2nd and 3rd Brazilian Meeting on Research Integrity, Science and Publication Ethics (Brispe) ⁹, which gave the opportunity to broaden knowledge on topics related to ethics in research. The 4th Brispe, held in Goiás in 2016, focused on encouraging ethical conduct in research, highlighting the need to restrain poor attitude of researchers and students from the start of school education ¹⁰.

Ethical principles for medical research involving human beings were discussed in the 64th General Assembly of the World Medical Association (WMA) ¹¹, which was held in Fortaleza, Brazil, in 2013. And in 2015 the country hosted the 4th World Conference on Research Integrity. All these events opened space for a new round of discussion on research ethics in the Brazilian scientific scenario.

The concern with ethics training of the health professional has grown in some Brazilian institutions, although there are still few organisations that invest in control and incentive of scientific rigor in research. Due to the investment in academic research, some government-sponsored development agencies, such as the Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq (National Council for Scientific and Technological Development) ¹², already supervise research linked to the scholarships they finance. The Fundação de Amparo à Pesquisa do Estado de São Paulo - Fapesp (Foundation for Research Support of the State of São Paulo) ¹³ is also another institution that

is concerned with the commitment of professionals in the exercise of their activities.

Junior researchers often lack guidelines on methodological and ethical rigor, and the constant demand for publications may lead them to prioritise quantity rather than the quality of scientific production¹⁴.

Objective

To verify the scientific integrity of health professionals in medicine, nursing, pharmacology nutrition, dentistry and biomedicine, considering how their ethical codes and curricular guidelines assist permanent education.

Method

It is a retrospective and descriptive study, carried out through categorical content analysis of documentation. The six subject areas with the most publications in the CNPq were selected and we analysed their ethical codes, which were elaborated by their respective federal councils:

- Código de Ética Médica. Resolução CFM 1.931 (Code of Medical Ethics. Resolution CFM 1,931) September 17 2009¹⁵
- Código de Ética dos Profissionais de Enfermagem. Resolução Cofen 564 (Code of Ethics for Nurses. Cofen Resolution 564) 6 November 2017¹⁶.
- Código de Ética Odontológica. Resolução CFO 118 (Code of Ethics for Dentists . Resolution CFO 118) 11 May 2012¹⁷.
- Código de Ética do Nutricionista. Resolução CFN 599 (Code of Ethics for Nutritionists. Resolution CFN 599) 25 February 2018¹⁸.
- Código de Ética da Profissão Farmacêutica. Resolução CFF 596 (Code of Ethics for Pharmacists. Resolution CFF 596) 21 February 2014¹⁹.
- Código de Ética do Profissional Biomédico. Resolução CFBM 198 (Code of Ethics for Biomedical scientists. Resolution CFBM 198) 21 February 2011²⁰.

As a research method, the descriptors “ethics in scientific publication”, “plagiarism” and “data reliability” (based on the DeCS - Health Sciences Descriptors), “scientific integrity” and self plagiarism were selected. We have searched for occurrences of these descriptors in the codes of ethics and in the curricular guidelines of the fields of health sciences surveyed:

- National Curricular Guidelines for the Undergraduate Course in Medicine, instituted by the National Education Council in 2014²¹.
- National Curricular Guidelines for the Undergraduate Course in Dentistry, instituted by the National Council of Education in 2002²².
- National Curricular Guidelines for the Undergraduate Course in Nutrition, instituted by the National Council of Education in 2001²³.
- National Curricular Guidelines for the Undergraduate Course in Pharmacy, instituted by the National Council of Education in 2002²⁴.
- National Curricular Guidelines for the Undergraduate Course in Nursing, instituted by the National Council of Education in 2001²⁵.
- National Curricular Guidelines for the Undergraduate Course in Biomedicine, instituted by the National Council of Education in 2003²⁶.

The data were inserted in two spreadsheets: the first one presented occurrences of the descriptors in the curricular guidelines of the selected courses (Table 1), and the second one presented the occurrence of the descriptors in the codes of ethics (Table 2).

The project was submitted to the Comitê de Ética em Pesquisa da Fundação de Ensino e Pesquisa em Ciências da Saúde da Secretaria de Saúde do Distrito Federal (Ethics Research Committee of the Health Sciences Education and Research Foundation of the Health Department of the Federal District) and exempted from ethical analysis for not involving human beings.

Results and discussion

The curricular guidelines establish norms and standards for the training of professionals in each area, directing study subjects, stipulating academic standards and stimulating practices for the exercise of the profession.

The curricular guidelines for the medical course establish that the basis for obtaining good results in scientific research is the adequate analysis of the sources, with careful evaluation of the evidence²¹. The guidelines for nursing courses, in turn, establish that the training of the qualified professional should be based on the scientific and intellectual rigor built on the pillars of ethics²⁵. Pharmacy and dentistry emphasise the value of academic education that stimulates the formation of intellectually independent professionals²⁴, with action based on ethical principles.

Table 1. Descriptors of scientific integrity in the curricular guidelines of medicine, dentistry, nutrition, pharmacy, nursing and biomedicine courses

	Scientific integrity	Ethics in scientific publications	Promotion of research	Plagiarism or self plagiarism	Data reliability
National Curricular Guidelines for the Undergraduate Course in Medicine (2014)	Art. 22, II	There is no mention	Art. 19, III	There is no mention	There is no mention
National Curricular Guidelines for the Undergraduate Program in Dentistry (2002)	Art. 5, VI	There is no mention	Art. 8; Art. 13, III	There is no mention	There is no mention
National Curricular Guidelines for the Undergraduate Course in Nutrition (2001)	There is no mention	Art. 14	Art. 8	There is no mention	There is no mention
National Curricular Guidelines for the Undergraduate Course in Pharmacy (2002)	Art. 3, Art. 13, V	There is no mention	Art. 8	There is no mention	There is no mention
National Curricular Guidelines for the Undergraduate Course in Nursing (2001)	Art. 3, I	There is no mention	Art. 8	There is no mention	There is no mention
National Curricular Guidelines for the Undergraduate Course in Biomedicine (2003)	Art. 3, I	There is no mention	Art. 9; Art. 14	There is no mention	There is no mention

Even in face of these precepts, it is still rare to find policies that detect and reduce scientific misconduct in universities²⁷. The inclusion of subject-related disciplines in undergraduate courses and frequent scientific practice, based on correct academic conduct, can help to minimise ethical infractions in scientific research, in view of the fact that education is the most transformative power when seeking good practices⁸.

In addition to the academic curriculum, health sciences education should include students' co-responsibility for continuing education, prioritising intellectual autonomy and social responsibility¹⁵. When starting a research, it is ideal that the health professional is aware of the legal aspects that involve ethics in order to act according to the norms of authorship and to avoid ethical infractions in the research²⁸.

The analysis of the codes of ethics has shown that scientific reliability was scarcely mentioned. Only the codes of ethics of medicine, nursing, pharmacy and biomedicine professionals deal with this issue. They all present the descriptors "ethics in scientific publication" and "plagiarism".

Although most of the codes refer to themes related to scientific rigor, the approach is focused on plagiarism and data reliability, without any deep analysis of the ethical behaviour advocated

in the academic field. Article 3 of the biomedicine curricular guidelines mentions the importance of adequate professional training, specifying critical thinking training based on scientific and intellectual integrity as well as ethical principles²⁶.

The data reliability was mentioned by five of the six codes analysed (only the pharmacist code does not mention the topic). In its chapter XVII, article 50, item VIII¹⁷, the Code of Ethics for Dentists prohibits the manipulation of data; the Code of Ethics for Nurses do the same, referring to the manipulation or falsification of data in its chapter III, article 97¹⁶. The Code of Ethics for Nutritionists prohibits the alteration of research data, either for own benefit or third party benefit in its chapter I, article 26¹⁸. Only the Code of Ethics for Pharmacists refers to the importance of veracity of information, in its chapter V, article 16, item I¹⁹ (Table 2).

Encouragement to integrity in scientific research is present in Chapter III, article 12, item XVI of the Code of Ethics for Pharmacists, which highlights respect for ethical norms and the protection of research subjects. In turn, article 13 of the National Curricular Guidelines for the Undergraduate Course in Pharmacy emphasises that the student must be committed to the journey in search of new results in scientific research, always safeguarding human rights²⁴.

Table 2. Descriptors of scientific integrity in codes of ethics of medicine, dentistry, pharmacy, nursing, nutrition and biomedicine

	Scientific integrity	Ethics in the scientific publication	Self-plagiarism	Plagiarism	Data reliability
Code of Medical Ethics (2009)	Art. 99, Art. 100; Art. 101; Art. 103	Art. 107	There is no mention	Art. 108	Art. 109
Code of Ethical Dentistry (2012)	There is no mention	Art. 49	There is no mention	Art. 49, II, III, IV	Art. 49, VI; Art. 50, VIII
Code of Ethics for Pharmacists (2014)	Art. 12, XVI(annex I)	Art. 16, II (annex I); Art. 8, XVI (annex III)	There is no mention	Art. 16, II, V (annex I); Art. 8 ^o , XVI (annex III)	There is no mention
Code of Ethics for Nurses(2017)	Art. 57; Art. 58; Art. 95	Art. 18; Art. 98; Art. 99; Art. 101 and Art. 102	There is no mention	Art. 100	Art. 97
Code of Ethics for Nutritionists (2018)	Art. 39; Art. 79 ; Art. 81	Art. 54; Art. 82; Art. 83	There is no mention	Art. 80	Art. 26
Code of Ethics for Biomedical scientists (2011)	Art. 30, VII	Art. 10, g, h, j	There is no mention	Art. 10, i	Art. 12, XV

In its fundamental principles ¹⁶, the Code of Ethics for Nurses guides the practice of the profession based on ethical, legal, technical-scientific and theoretical-philosophical precepts, with the competence and qualification to assist, teach, educate and research. Similarly, the Code of Ethics for Pharmacists guides the importance of the performance based on scientific and intellectual rigor in its Chapter I, article 7 ¹⁹.

With professionals oriented to conduct scientific research according to ethical principles - without plagiarism, without falsified data, with due citations, correct interpretation of statistics and results obtained with scientific research - the incidence of retractions would reduce, and the results of the studies would have more credibility ⁸.

Codes of ethics should motivate these professionals to follow good practice in research, guided by principles of morality and ethics ²⁹. It is worth mentioning that of the six codes of ethics analysed, only four clearly mention themes related to ethics research. The Code of Ethics for Nurses, in its Chapter II, article 58, affirms the importance of respecting ethical principles in research ¹⁶, the Code of Ethics for Pharmacists, in its Chapter I, article 7, emphasises the value of abiding by scientific and intellectual rigor ¹⁹, the Code of Ethics for Nutritionists, in its Chapter VII, article 81, states that it is the professional's duty to

declare the existence of conflicts of interest, assure methodological impartiality, data processing and disclosure of funding sources, and Chapter XI, article 30, item VII of the Code of Ethics for Biomedical scientists mentions that it is the ethical duty of the professional not to commit fraud in the profession and in the production of biomedical knowledge ²⁰.

We observed an explicit concern about mentioning the sources in four of the codes of ethics: medicine, nutrition, nursing and biomedicine. The code of medical ethics and the code of ethics for nutritionists make considerations about plagiarism, with specifications on how to use information from documents not yet published by the author ^{15,18}. The Code of Ethics for Nurses deals with the subject mentioning respect for copyright in its Chapter II, article 58 ¹⁶ and the reference to the authors involved in its Chapter III, article 100 ¹⁶.

Final considerations

The analysis of curricular guidelines has demonstrated the need to implement already established guidelines to restrain scientific fraud, since formal norms must become reality in the professional and academic spheres. Scientific integrity must be promoted throughout academic training through student's searching for intellectual autonomy and social responsibility.

Thus, the curricular guidelines should steer the continued formation of the health professional, stimulating good scientific practices at any stage of education and establishing academic punishments for unethical conduct. They should, in particular, bring the student closer to the topic of ethics in research, making him or her gain familiarity with issues related to scientific rigor.

Codes of ethics should establish rigorous standards that will definitely discourage poor conduct. Meticulous supervision of publications by institutions promoting education and research, as well as the establishment of ethical and legal sanctions for

professionals with poor scientific behaviour, should also be encouraged to eliminate fraud. In the current stage of relative banalisation of poor procedures, educational actions of orientation and training of professionals are relevant, but insufficient, since in order to reach a proper ethical standard it is essential to contain misconducts as soon as possible.

It is necessary to educate health professionals and researchers to produce scientific works that are valid and relevant to the community. This ongoing work of continuous training and qualification should begin in educational institutions and carry on in professional regulation through codes of ethics.

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Participation of the Author's

The authors participated in all phases of the production of the article.

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