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Assessing formal teaching of ethics in physiology: an empirical survey, patterns, and recommendations

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Goswami N, Batzel JJ, Hinghofer-Szalkay H. Assessing formal teaching of ethics in physiology: an empirical survey, patterns, and recommendations. *Adv Physiol Educ* 36: 188–191, 2012; doi:10.1152/advan.00010.2012.—Ethics should be an important component of physiological education. In this report, we examined to what extent teaching of ethics is formally being incorporated into the physiology curriculum. We carried out an e-mail survey in which we asked the e-mail recipients whether their institution offered a course or lecture on ethics as part of the physiology teaching process at their institution, using the following query: “We are now doing an online survey in which we would like to know whether you offer a course or a lecture on ethics as part of your physiology teaching curriculum.” The response rate was 53.3%; we received 104 responses of a total of 195 sent out. Our responses came from 45 countries. While all of our responders confirmed that there was a need for ethics during medical education and scientific training, the degree of inclusion of formal ethics in the physiology curriculum varied widely. Our survey showed that, in most cases (69%), including at our Medical University of Graz, ethics in physiology is not incorporated into the physiology curriculum. Given this result, we suggest specific topics related to ethics and ethical considerations that could be integrated into the physiology curriculum. We present here a template example of a lecture “Teaching Ethics in Physiology” (structure, content, examples, and references), which was based on guidelines and case reports provided by experts in this area (e.g., Benos DJ. Ethics revisited. *Adv Physiol Educ* 25: 189–190, 2001). This lecture, which we are presently using in Graz, could be used as a base that could lead to greater awareness of important ethical issues in students at an early point in the educational process.

**METHODS**

An e-mail was sent out to several universities, including Organization for Economic Cooperation and Development countries (www.oecd.org/membecountries), with the following message: “We are now doing an online survey in which we would like to know whether you offer a course or a lecture on ethics as part of your physiology teaching curriculum.” This e-mail was sent out by the head of the Institute of Physiology (H. G. Hinghofer-Szalkay) of the Medical University of Graz to corresponding heads of physiology institutes at universities offering undergraduate medical degrees. As most of the graduating doctors are required to do some form of research, such as a dissertation thesis, it was hoped that this question would also shed some light on research ethics: value of ethics in physiology training for future physicians and the value of ethics in physiology for research-oriented issues [e.g., publication (1)].

An online search was conducted worldwide for universities offering medical training, leading to a list of institutions and contact details of heads of departments. Specifically, countries were searched online with the following keywords: “country X, medical schools.” The inclusion of a university in the list depended on 1) the availability of a homepage/website of the physiology institute, 2) a valid e-mail address for the head of the institute, 3) the geographic location of the university, and 4) researchers in correspondence with, and/or collaborators of, the Institute of Physiology of the Medical University of Graz. The last criteria (option 4) was mainly to improve the response rate; at the time of the survey, however, we had no idea of their

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practices of incorporation of ethics into the physiology curriculum. To prevent excessive inclusion of universities from a particular country, we typically limited inclusion to a maximum of 2–3 universities/country. As we did not have any preconceptions on the outcome of our survey, we examined ethical teaching practices in physiology from a global viewpoint rather than exhaustively looking at a particular country.

There was no specific order used to contact institutions or institutions located within a country. In cases where we did not receive any response within a month, a repeat/reminder e-mail was sent out. If we still did not receive any reply, a second reminder was sent out.

The results of the survey were classified using predetermined categories of “no” and “yes.” The extent of inclusion of ethics in the physiology curriculum (the “yes” response) was further categorized by classification into the following subcategories: 1) no formal ethics course but ethical teaching generally integrated into the overall physiology curriculum, 2) an ethics lecture included in the physiology curriculum, and 3) more than one lecture in ethics or a course or a module included in the physiology curriculum.

A waiver was obtained from the Ethics Committee of the Medical University of Graz. Our study was conducted according to the guidelines of the Data Protection Act (§14 Abs. 1DSG 2000).

Data analysis. Descriptive statistics (numbers and percentages) were computed for the responses to the e-mail survey. As the data were limited, we attempted to quantitatively characterize our results to strengthen the descriptive statistics and subsequent conclusions. A χ²-analysis was used to assess the four categorical variables. Significance was assumed when $P < 0.05$.

RESULTS

The response rate was 53.3%; we received 104 responses of a total of 195 sent out. Our responses came from 45 countries: Angola, Australia, Austria, Bahrain, Bangladesh, Belgium, Bulgaria, Canada, China, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Guyana, Hungary, India, Ireland, Israel, Italy, Japan, Latvia, Malaysia, New Zealand, The Netherlands, Nigeria, Norway, Oman, Poland, Romania, Russia, Scotland, Singapore, Slovakia, Slovenia, Sri Lanka, South Africa, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States of America.

All our responders confirmed that there was a need for including ethics in medical education and scientific training. Most of the responders answered with a clear “no” in regards to the current inclusion of formal ethics teaching in the physiology curriculum (69%). The responses are shown in Fig. 1.

A response was counted as “yes” if the respondent indicated that ethics was in some way purposefully (formally) incorporated into the curriculum, even if no specific course or set of lectures was offered on this topic. The group with more than one lecture in ethics or a course or a module included in the physiology curriculum was considered to have a high emphasis on ethics in physiology as reflected by the inclusion of lectures that covered key ethical issues and/or the inclusion of invited guests who discussed ethical issues from scientific and philosophical aspects as well as the involvement of experts from Ethics Committees.

Taking as baseline the assumption that the inclusion and noninclusion of formal ethics teaching were equally likely, a χ²-test indicated that our results were significantly different ($\chi^2$-score 14.8, degree of freedom: 1, $P = 0.001$) from this expectation and showed that a significant majority of institutions do not teach ethics. Furthermore, among those who do, there was an equal likelihood of general integration versus single lecture versus multiple lectures or a full course ($\chi^2$-score 2.03, degrees of freedom: 2, $P = 0.322$).

Our results also showed that formal teaching of ethics in the physiology curriculum is presently mainly confined to the United States, United Kingdom, and Canada (the “yes” responders). It appears that typically countries in Europe, Asia, Africa, and Oceania/Australia still do not have the teaching of ethics formally in the physiology curriculum; in these countries, ethical issues are addressed as part of the typical training in medical ethics as a part of the generalized medical curriculum.

One difficulty of our online survey is that some universities offering undergraduate medical courses use the new modular system. Under the modular system, there is no specific teaching of physiology, and physiology tends to be incorporated into different modules. In those cases, we wrote to the universities again and enquired further. In all cases, we were informed that ethics, when taught, was specific to general medical ethics and not physiology. We then classified those universities under the “no” category.

DISCUSSION

The results of our survey showed that for the large majority of universities offering undergraduate medical education, including our Medical University of Graz, formal teaching of
ethics in physiology is not explicitly incorporated into the physiology curriculum. It appears that ethics is an area that most institutions incorporate into the final year of the medical studies, as medical ethics. This is quite surprising, as ethical issues are fundamental to the process of physiological research (1–4). While the prevalence and nature of medical ethics education in medical schools have been previously assessed (12), we are not aware of any study that has examined the extent of formal ethical teaching in physiology curriculum.

In agreement with the comments expressed in an Advances in Physiological Education editorial (1), we see a definite need to have at least some form of formal ethical teaching integrated into the physiology curricula of universities. On the other hand, we understand that the inclusion of new courses/modules, such as ethics, in an existing physiology curriculum is problematic and often subject to institutional barriers and untimely delay.

However, the training of physiology students in ethical thought processes and attitudes can be incorporated in a natural way by examining issues related to a number of topics. These include the following (2, 5–8, 10, 13): research on humans, research on animals, standards for accuracy and objectivity in measuring data and reporting results, consistency in reporting supportive and contrary results, academic integrity and collaborative honesty, plagiarism, conflict of interests, rules for collaborations and research reporting, and involvement of authors. From this list, it is clear that physiological research constantly confronts ethical questions and that physiology class discussion can therefore be motivated and directed toward the examination of many questions related to ethical problems.

Below we provide some open-ended questions and discussions that have now been implemented by us in a specific lecture dedicated to ethics in physiology. These are based on areas identified and discussed in Ref. 2. Some of these are as follows:

1. Can you define scientific misconduct?
2. What ethical issues can arise during planning an experiment?
3. What are the issues related to human and animal experimentation?
4. How do you define, identify, and prevent fabrication of data and plagiarism?
5. What do you understand by publishing ethics?

Based on comments from the students, each of these questions can then further explored, using material from existing practices of teaching of ethics in physiology (2, 5–8, 10, 13). These include case summaries, such as those elaborated in Ref. 2. The broad areas discussed are shown in Fig. 2.

Finally, each student can be provided the poster produced by the American Physiological Society regarding ethical issues when writing a scientific paper (http://www.apsarchive.org/resource.cfm?submissionID=1262). For details regarding approaches to the formal teaching of ethics in physiology, please see Refs. 2, 5–8, 10, and 13.

We want to emphasize that we are not discussing here the inclusion of standard medical ethics training, which is routinely treated at some point in medical schools. Rather, we are discussing a focus on ethical issues related to basic research—a focus that can be developed at a fundamental level during physiology course lectures and at an early stage in the education process. To not include such ethical training is to lose an important opportunity to shape ethical character and standards and future behavior.

Finally, we wish to include the observation that teaching physiology itself carries with it responsibilities that have an ethical

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**Fig. 2.** Aspects of scientific misconduct and other ethical issues that we teach in our newly designed lecture. This was based on the case summaries provided in Ref. 2. Scientific misconduct can occur at levels of experimental planning, study design, data collection and interpretation, and publishing.
dimension. The quality of future clinical practice depends on the effectiveness of the training received by medical students. Proper judgement of dynamic processes within the body is a prerequisite of prudent medical thinking and action. A deep understanding of physiological principles can enhance effectiveness and guide a physician’s decisions. We believe that physiology teachers should keep in mind the impact of teaching on how well students will eventually treat patients in their medical practice even if that impact from that teaching is very hard to trace (9).

Limitations. Lehmann et al. (12) obtained a response rate of >70% when they sent out postal questionnaires regarding medical ethics education to medical institutions in Canada and the United States (12). Despite two reminders, the response rate to our online question was not high (53%). In fact, our attempts to find out about the formal teaching of ethics in physiology in several countries were often hampered by unavailability of websites, websites in specific languages, non-functional e-mail addresses, or just a pure lack of response. Despite our intensive efforts for over 8 mo, we were unable to obtain more responses.

The aim of this empirical survey was to assess the extent of inclusion of formal teaching of ethics in physiology curriculum. The results of our survey do not represent a comprehensive statistical overview of the practices of incorporating ethics in physiology worldwide. Rather, the results provide some insights into existing practices with regards to the formal teaching of ethics in physiology. We believe the results reflect the existing trends and are qualitatively accurate. Finally, we are not aware of any study that has examined patterns of formal ethical teaching in physiology across several countries in North America, Europe, Africa, Asia, and Oceania/Australia.

Future directions and perspectives: expanding and extending the survey. Based on results of the pattern of formal ethical teaching in physiology, it is evident that apart from the United States, United Kingdom, Canada, ethics are not often included in the physiology curricula. To obtain a more comprehensive picture of the extent of inclusion of formal teaching of ethics in physiology curriculum, it is necessary to overcome several problems, including the existence of medical university webpages that are not in English, general unavailability of medical institution websites, and correct/functional e-mail addresses of some heads of physiology institutes. To pursue greater detail on the practices we have examined, we suggest that the physiological societies of various countries be enlisted to contact their member institutions to gain detailed information. In this way, each physiological society would be able to provide both an overview and more precise detail on the formal teaching of ethics in physiology for the country represented by that society and ensure greater participation in the survey by members. Increasing the sample size from each country and getting responses from more countries would strengthen our conclusions, which were drawn on prevalence, and permit better characterization of national/regional variance. Finally, the research should be extended to include several questions such as details of lectures or modules taught, extent of inclusion of human and animal ethics in physiology (e.g., sample size, animal welfare, animal euthanasia methods, etc.), scientific misconduct, publishing problems, etc. (2, 5–8, 10, 13).

Conclusions. Since the curriculum of physiology does not typically define the boundaries of ethical considerations, and given the problems related to ethical practices as observed in the editorial above (2), we suggest the need to have at least some form of formal ethical teaching integrated into the physiological curriculum. We describe here some areas where we have begun to introduce ethical considerations into physiology training. These areas include good laboratory practice, aspects of human and animal experimentation, the planning of experiments, aspects of data analysis (avoidance of fraud, misrepresentation, and manipulation of data), and publication. In all of these areas, ethical issues can seamlessly, and in a motivated way, be incorporated into physiology education. Furthermore, we note that the responsibility to convey solid physiological knowledge and understanding has ethical implications (2, 5–8, 10, 13).

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DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the author(s).

AUTHOR CONTRIBUTIONS

Author contributions: N.G., J.J.B., and H.G.H.-S. conception and design of research; N.G. and J.J.B. analyzed data; N.G., J.J.B., and H.G.H.-S. interpreted results of experiments; N.G., J.J.B., and H.G.H.-S. prepared figures; N.G., J.J.B., and H.G.H.-S. drafted manuscript; N.G., J.J.B., and H.G.H.-S. edited and revised manuscript; N.G., J.J.B., and H.G.H.-S. approved final version of manuscript.

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