Innovative Information Technologies in Medicine, the Ethical Aspects – Medical Students' Opinion

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Abstract

The aim of this paper is to explore medical students' opinion on the role of medical ethics course for their future practice and professionalism. Furthermore the research focuses on the usage of innovative information technologies such as artificial intelligence (AI), big data, etc., in medicine and the ethical implications that arise when they are applied. In modern medicine, innovative information technologies hold promise to help medical professionals to solve problems within their every day clinical practice, to improve health care delivery as well as to provide optimal outcomes to patients. A survey was conducted among first academic year medical students in the Faculty of Medicine in Medical University – Sofia in Bulgaria. To achieve the purpose of the study a web-based questionnaire was distributed to students after the end of their course in medical ethics. From data collected students believe that ethical knowledge would contribute to their professionalism. The subject is actual, thus the authors will further continue the research. Any comparison results will be provided in a more detailed analysis also in the future. The current results show that according to the students, the incorporation of innovative information technologies in medical practice poses new challenges regarding compliance with ethical principles and norms. In addition guidelines ensuring an appropriate ethical framework to strengthen values, are necessary.

Keywords
Innovative information technologies, artificial intelligence, medical ethics, students' opinion

1. Introduction

Medical ethics is a form of applied, normative ethics, which include the application of the universal ethical principles and norms when specific moral dilemmas arise in medical practice, when provided medical care, and in bio-medical research [1]. The main purpose of the medical ethics course is to familiarize the students with the four fundamental biomedical principles namely the principle of [2]:

- respect to patient autonomy,
- beneficence,
- non-maleficence, and
- justice.

Medical ethics is a course incorporated in the educational program for medical students in the first semester in first academic year in the Faculty of Medicine in Medical University – Sofia, (MU-Sofia). Ethical knowledge is a tool provided to future medical professionals, in order to help them in dealing with the ethical issues arising in clinical practice. Thus after the end of the respective course students are able to reflect, and identify ethical issues in medicine, apply the principles in order to make moral decisions, and provide optimal care to the patient.

Our curriculum integrate the knowledge of the fifteen bioethical principles of the UNESCO Universal Declaration on Bioethics and Human Rights [3], and the respective methodology:

1. Human dignity and human rights;
2. Benefit and harm;
3. Autonomy and individual responsibility;
4. Consent;
5. Persons without the capacity to consent;
6. Respect for human vulnerability and personal integrity;
7. Privacy and confidentiality;
8. Equality, justice and equity;
9. Non-discrimination and non-stigmatization;
10. Respect for cultural diversity and pluralism;
11. Solidarity and cooperation;
12. Social responsibility and health;
13. Sharing of benefits;
14. Protecting future generations;
15. Protection of the environment, the biosphere and biodiversity.

In addition, innovative information technologies and more specifically technologies such as AI, big data, etc. are widely used in medicine, but their application raises social, legal and ethical issues.

A concrete example of initiative in this direction is focused on AI systems, and is applicable also in the case of medical applications, and the usage of such systems in medicine, as systems that should improve individual and collective wellbeing [4, 5]. It was in June 2018 when the European Commission set up the High Level Expert Group on AI [6], to offer guidance on a comprehensive framework for trustworthy AI. Three are the components of trustworthy AI, which should be met throughout the system's entire life cycle:

1. should be lawful,
2. should be ethical, and
3. should be robust.

In order to ensure that AI systems are developed, deployed and used in a trustworthy way, four ethical principles, which are specified as ethical imperatives, must be respected. These principles rooted in fundamental rights and are follow:

1. respect for human autonomy,
2. prevention of harm,
3. fairness, and
4. explicability.

Aiming to provide with detailed guidance on how trustworthy AI can be realized, seven requirements that AI systems should meet were listed. It was proposed that both technical and non-technical methods could be used for their implementation. The main advice, regarding the seven key requirements for trustworthy AI is to ensure that the development, deployment and use of AI systems meet them:

- human agency and oversight,
- technical robustness and safety,
- privacy and data governance,
- transparency,
- diversity, non-discrimination and fairness,
- environmental and societal well-being and
- accountability.

In medicine physicians make clinical decisions based on evidences and values. Following the fundamental principles ensures that the decision was on ethical basis.

In conclusion this is the medical ethics course focus and this is our research approach, and of course the respective results that will be presented in the current paper.

2. Methodology

Herein we analyze medical students' opinion on the role of medical ethics education for their future clinical practice and professionalism, as well as stu-

dents' views on the application of AI, big data and other innovative information technologies, in medicine and the related ethical considerations that arise.

To achieve the purpose of the study a web-based questionnaire was distributed among 244 first academic year medical students in the Faculty of Medicine from Medical University – Sofia in Bulgaria. The data was collected during January 2022, after the end of the course on medical ethics. Completed questionnaires were received from 191 students (78.3% of the students). All of them participated anonymously and voluntarily.

The questionnaire consisted of 10 questions related to students attitude towards medical ethics education, the role of ethical knowledge into their future practice, ethical issues addressed during the pandemic, preferred teaching methods during the course in medical ethics. In addition questions related to the use of AI, big data and etc. in medicine and the ethical problems that arise with this application, were asked. A descriptive statistical method was used to analyze the data collected.

The majority of the questions were developed as closed and if only they answered "other" or "yes" in a question, students had to specify their answer. Statements related to closed questions were given a range for the answer like:

• Yes / No
• Yes, No, "I cannot evaluate"

As we focused to achieve the best participation rates from the respondents, the questionnaire was developed by flowing the questions from the more general to the more specific, from the least sensitive to the most sensitive one.

Herein we will demonstrate partially the results of our survey, related to students' attitude towards medical ethics education and the students' views in the application of innovative information technologies, including AI, big data and others in medicine

3. Results

A total amount of respondents in this survey was 191 medical students from the Faculty of Medicine in Medical University – Sofia in Bulgaria.

We divided the answers into two parts. First we analyze some of the questions related to student's attitude towards medical ethics education, following by students' views on the incorporation of innovative informational technologies in medicine and their ethical implications.
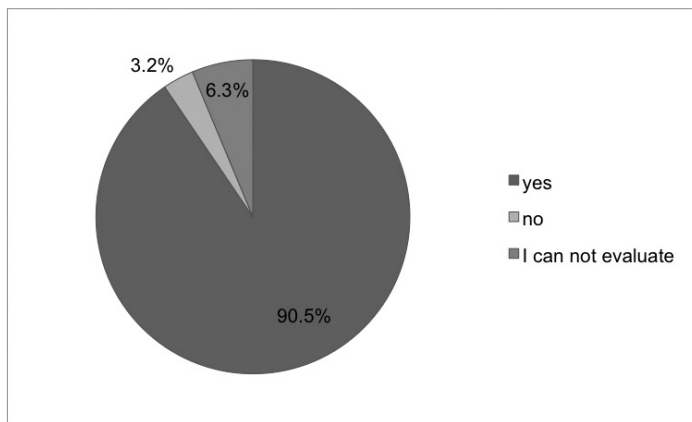
3.1. Students' attitude towards medical ethics education

To the question "Do you think that ethical knowledge will help your reasoning in making decisions and applying them in your future medical practice?", the

majority (90,5%) of the respondents answered "yes", 6,3% answered "I can not evaluate", and only 3,2% of the students respond "no" (see Figure 1).

Further question, asked to survey participants, concerned the principles of the UNESCO Declaration on Bioethics and Human Rights. The participants were asked to evaluate, for which of the principles, they need more in-depth knowledge, in order to deal more effectively with ethical issues in their clinical practice.

Data show that medical students need more in-depth knowledge in order to deal more effectively with ethical issues in their clinical practice, in principles related to "people without the capacity to give consent" (48,7%), "human dignity and human rights" (45,5%), "autonomy and personal responsibility" (42,4%), and "consent" (37,7%).


Figure 1: "Do you think that ethical knowledge will help your reasoning in making decisions and applying them in your future medical practice?"

The list is followed by the "equality, justice and equity" (37,2%), "social responsibility and health" (36,6%,), "respect for human vulnerability and personal integrity" (34,6%), "non-discrimination and non-stigmatization" (30,9%), "protecting future generations" (27,7%), "solidarity and cooperation" (27,2%), "protection of the environment, the biosphere and biodiversity" (26,7%), "respect for cultural diversity and pluralism, and principle sharing of benefits" (25,1%), and finally on the principle related to "privacy and confidentiality" (24,6%). A detailed distribution of results is demonstrated below (see Figure 2).
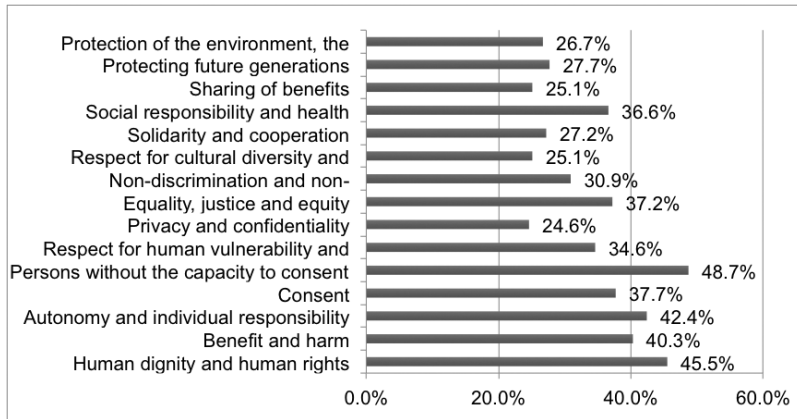
Figure 2: "In which of the principles of the UNESCO Declaration on Bioethics and Human Rights / 2005 / do you think you need more in-depth knowledge in order to deal more effectively with ethical issues in your clinical practice"

It is worth mentioning that regarding the answer to the question "Which of the following ethical interventions and institutions do you think will contribute to dealing with ethical issues in modern medical practice?" the majority (64%) of the respondents indicated "the procedures for informed consent", 56,6% answered "the guidelines for good medical practice", 56,1% "the ethics committees", 28% "the principle of publicity and dialogue", and 19% "the professional organizations" (Figure 3).
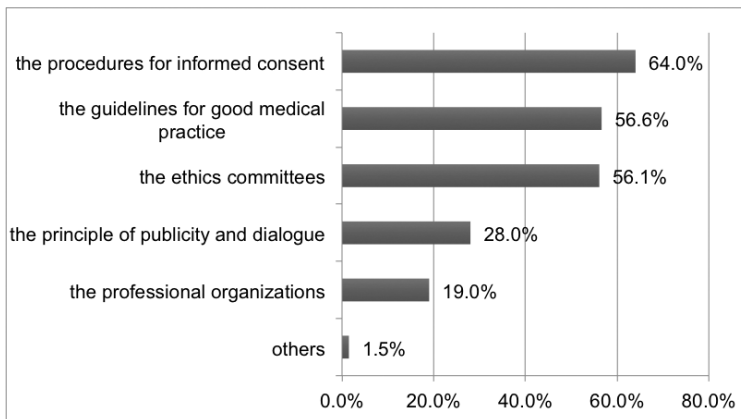
Figure 3: "Which of the following ethical interventions and institutions do you think will contribute to dealing with ethical issues in modern medical practice?"

3.2. Students' views on the incorporation of innovative informational technologies in medicine and their ethical implications

The next figure shows the percentage distribution to the question "Do you think that with the application of innovative information technologies, such as artificial intelligence, big data analysis, etc. in medicine, ethical dilemmas could arise in medical practice?" (see Figure 4). Here we see that most of the future physicians (67%) answered, "Yes", 23,6% answered they cannot evaluate, and 9.4% answered "No".
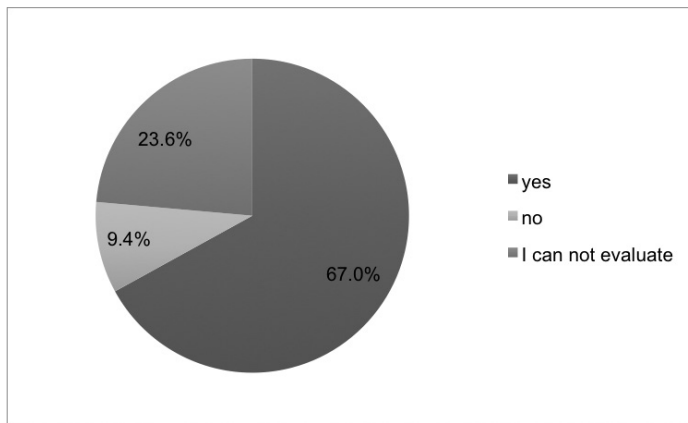
Figure 4: "Do you think that with the application of innovative information technologies, such as artificial intelligence, big data analysis, etc. could arise ethical dilemmas in medical practice?"

When a positive answer received to the previous question we asked the participants to indicate in which field. The data presented (see Figure 5) shows that the majority of the respondents (65,7%) focus on the protection of personal data, 57,5% on confidentiality, 55,2% on privacy, 38,1% on justice, 32,1% on transparency, 29,9% on social and environmental well-being, 22,4% on discrimination, 17,2% on accountability, 15,7% on diversity, and 0,7% indicated others fields.
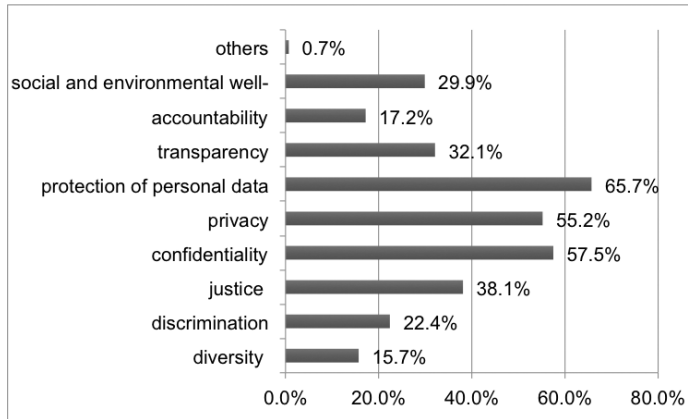
Figure 5: If "Yes" (meaning, agree that with the application of innovative information technologies, such as artificial intelligence, big data analysis, etc. could arise ethical dilemmas in medical practice) please indicate in which field

4. Conclusions

The main goals of this survey were to present medical students' attitude towards medical ethics education as well as their views on the ethical implications after the incorporation of innovative informational technologies in medicine. The authors intend to conduct further research, and provide comparison results, but also consider a more detailed analysis of the results in the future. From data obtained a positive attitude towards medical ethics education is supported by the participants. However further efforts to promote trust in innovative information technologies as AI, big data, etc. in medicine are necessary to avoid discrimination and protect the most vulnerable populations. Meanwhile there is a lack of in-depth education on the application of digital technologies in medical practice. To cover this need multidisciplinary courses should be added in student programs to improve future medical professionals opinion, and develop trust with the innovative information technologies.

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