

THE AWARENESS OF MEDICAL WORKERS ON THE ARTIFICIAL INTELLIGENCE-BASED SOLUTIONS USED IN GASTROENTEROLOGY: AN EXPLORATORY SURVEY

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THE AWARENESS OF MEDICAL WORKERS ON THE ARTIFICIAL INTELLIGENCE-BASED SOLUTIONS USED IN GASTROENTEROLOGY: AN EXPLORATORY SURVEY (Abstract): Recently, significant changes regarding the approaches in several areas of daily life, healthcare, and research are emerging due to technological advance. The benefits of using artificial intelligence (AI) in medical care are suggestive. However, the opinion of the users could suggest several potential limitations. We **aimed** to evaluate the trends in understanding and using the AI-based solutions available in Medicine. **Materials and methods:** An online survey was designed and distributed to the members of the local academic and healthcare community regarding their perception on the AI-based applications used in their area of expertise. Furthermore, several items aimed to evaluate the perception of the potential users on the perceived advantages and weaknesses of AI-based applications in healthcare and medical research. **Results:** One hundred and fifteen medical workers were recruited for this study, of mean age 41 ± 10.07 years, and of whom 56.5 % were women. The majority of the responses demonstrated general understanding of AI-based applications in daily life and in medical act. As emphasized by several participants, some of the limitations of AI use in healthcare could arise based on AI-based solutions. Despite this, AI-based resources could offer high performance solutions to medical care and research consequent to technological progress. However, one of the most important drawbacks of AI-based solutions used in medical care could be related to the empathy involved in patient management. **Conclusions:** Further studies regarding the possible means to improve algorithm-based decision-making processes could be addressed to minimize AI-based solutions in medical care. **Keywords:** ARTIFICIAL INTELLIGENCE, MEDICAL CARE, AWARENESS, PERCEPTION, GASTRO-ENTEROLOGY.

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Artificial intelligence (AI) is currently known as the most advanced technical field in data analysis and research, as the novel algorithms closely resemble human intelligence through high-performance computer simulations (1). The concept of AI dates back to the mid-90s when it was first proposed by Alan Turing (2) and technically applied by John McCarthy throughout the Dartmouth Summer Research Project (3). The latter forecast the integration of AI in medical care, as the Turing test results were groundbreaking (associating the complexity of AI with the human brain) (4, 5). However, despite the initial excitement, the practical applications only recently materialized and led to the third scientific and technological revolution prior to unlimited data storage and instantaneous long-distance communication (6-8). While there are studies that point to some limitations (for example, unwanted effects on human cognition, as discussed by Firth *et al.* (9), AI technology was quickly introduced into different domains in daily life as well as in different professions, such as healthcare and medical practice, with promising applicability (10). In this context, AI-based solutions provided significant improvements in medical services, as reflected by high-resolution for the interpretation of images, prompt data processing, workflow enhancement, and lessening errors (11). Moreover, some opinions acknowledge the utility of AI in improving the efficiency of several activities that are currently affected by limitations, such as information acquisition (12).

Besides the algorithms behind AI and its three core processes (Machine learning - ML, Deep learning - DL, and Artificial neural network - ANN) which transpose into novel solutions for the most complex

challenges, controversies also arise. One pivotal part is the scarce transparency of the AI algorithms, notably the black box (13), and probable inaccuracies in disease diagnosis and treatment by eroding the patient-doctor relationship (14). AI could offer the achievement of personalized medicine and precision public health through its virtual (ML/DL) and the branches that offer user interfaces (carebots) (15,16), but not without raising, as anticipated, numerous ethical, professional, and technical questions. Considering the skepticism and divergent viewpoints on AI from medical students, physicians, and individuals, opinion surveys may help understand their overall perception.

Thus, we aimed to evaluate the trends in understanding and use of AI-based solutions available in medicine and healthcare. We also wanted to see whether if the lack of awareness, and mistrust of the users could be possible sources of controversy.

MATERIALS AND METHODS

Study design

A survey based on previously published studies from the UK (17, 18) and the US (19) via the Delphi modified method (17, 20, 21) was designed and disseminated among the medical workers from the Institute of Gastroenterology and Hepatology from the “St. Spiridon” County Emergency Clinical Hospital, Iasi, Romania, and the 42nd National Congress of Gastroenterology, Hepatology, and Digestive Endoscopy held June 7-10, 2023, in Iasi, Romania. Based on the previously reported data regarding similar outcomes, the survey was structured in four sections (17-19, 22, 23): (1) demographic and professional data; (2) the understanding of general and daily life artificial intelligence; (3) the understanding of medi-

cal care AI-based solutions and the willingness to use, if available; and (4) the human versus machine controversy. The inclusion criteria were: (1) Romanian medical doctors; (2) in Gastroenterology and Hepatology field of expertise; and (3) those who were admitted to the residency program or had already completed their training. The exclusion criteria consisted in: (1) medical workers that did not undergo residency programs; (2) medical studies; (3) currently not involved in medical care; or (4) medical workers whose expertise was not compatible with the Gastroenterology field.

Data analysis

All the data from the online surveying tool was collected in Excel format via the export option. *Version 26.0 of SPSS* (IBM SPSS Inc., Chicago, IL, USA) was used to statistically analyze the data. All the variables expressing categorical data were presented as percentages, while numerical variables were reported as mean and standard deviation (SD). Odds ratio, Wald test, and Fisher exact probability test were used to determine the influence of the demographic/professional variables on the binary answer items.

Ethical considerations

The survey was designed to be appropriate for online distribution via a free survey platform and was approved by the Ethics Committee of the “Grigore T. Popa” University of Medicine and Pharmacy (No. 301/4 May 2023). All the participants agreed with written informed consent and were recruited voluntarily, anonymously, and free of charge. Efforts were made not to collect personal data.

RESULTS

Demographic and professional characteristics

One hundred and fifteen medical care workers positively responded to the recruitment announcement via online notification. The description of the recruited participants in terms of demographic and professional characteristics is presented in tab. I. The sex distribution of the study group was 43.4 % males and 56.5 % females, while the mean age was 41 ± 10.07 years. The age interval of 30 - 39 years was predominant (47.82 %). All the participants came from the urban area. Finally, concerning the profession, about half of them (52.17 %) were primary care physicians.

TABLE I.

Demographic and professional characteristics of the population included in the study

Characteristics		Study group (N=115) n (%)
Gender	Male	55 (43.4)
	Female	65 (56.5)
Age	< 30	10 (8.69)
	30-39	55 (47.82)
	40-49	20 (17.39)
	> 49	20 (17.39)
	Total (years, mean \pm SD)	41 ± 10.07
Medical experience	Resident doctor	15 (13.04)
	Medical specialist	40 (34.78)
	Primary care physician	60 (52.17)

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Participants perceptions on artificial intelligence and everyday use

The second section of the survey focused on evaluating the general perceptions of the participants toward AI and their preferences to use basic and general AI-based applications, as they are available in daily life technology. The definitions offered by the participants for AI ranged between “algorithms” and “tech-

nology” (fig. 1). While 69.56 % of the participants use AI-based applications in their everyday lives, most of the participants generally enumerated chatbots (20.18 %), medical apps and AI-based scores (20.18 %), statistical tools (7.89 %), voice commands and recognition (11.40 %), and other multimedia apps and platforms (10.53 %) as the main AI-based solutions they encountered.

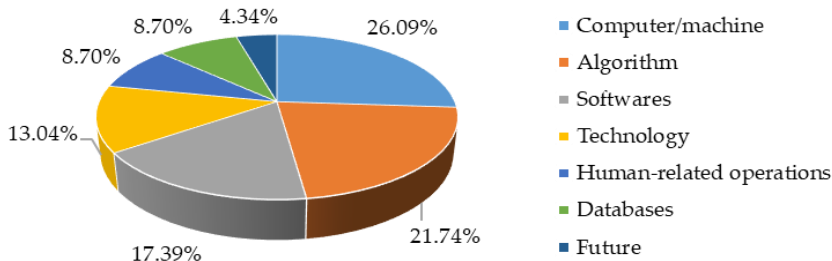


Fig. 1. Participants' preferences to use basic and general AI-based applications

Regarding the limitations of AI technology, 73.91 % of the respondents agreed that AI-based applications equally imply both advantages and disadvantages. While more than half of the respondents (52.17 %) do not consider that AI-based solutions could be the subject of serious security

breach, emotional and social issues (26.09 %), addiction (17.39 %), and predisposition to errors (16.52 %) were also mentioned as limitations (fig. 2). Furthermore, almost 70% of the participants stated that AI could possibly replace humans in certain tasks at some point in the future.

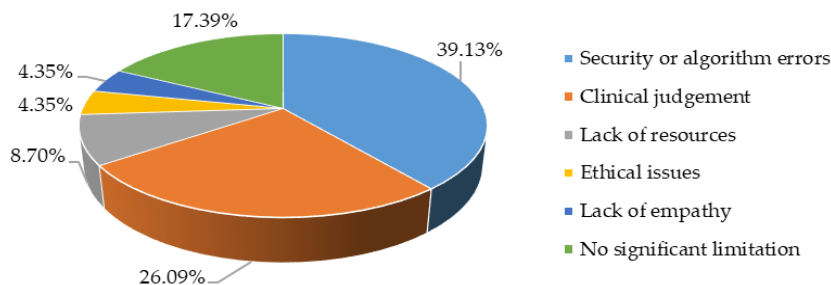


Fig. 2. Limitations of AI-based applications that are available for gastroenterology practice

Moreover, our results showed that neither age (OR=1.0085, 95% CI=(0.9661,

1.0527), $p=0.7$), nor the sex (OR=1.0370, 95% CI=(0.4650, 2.3127), $p=0.92$), did

significantly contribute to a segregation of responses regarding the idea of human being replaced by AI in certain tasks. On the other hand, all the medical residents and most of the primary care physicians (83.33 %) stated that AI could possibly replace humans in certain tasks at some point in the future. By contrast, only 37.5 % of the medical specialist doctors had the same opinion, this being a significant difference ($\chi^2=31.36$, $p < 0.001$, in Fisher exact probability test).

The understanding and use of AI-based solutions in gastroenterology

The third section of the survey aimed to evaluate the awareness of the participants on the AI-based solutions available for clinical practice in Gastroenterology. Not necessarily connected to the current field of practice, the most of the respondents (86.95 %) stated that Telemedicine would be a valuable tool in primary care. When we applied data stratification tests, we found that age (OR=0.9427, 95% CI=(0.8951, 0.9928), $p=0.025$) was significantly correlated as contributor to this opinion. Moreover, we found that men were less likely to report a positive response, as compared to women (OR=0.33, 95% CI=(0.1060,

1.0482), $p=0.05$). The analysis of the data showed that the medical experience of the respondents did not pose a significant difference in responses on the value of Telemedicine, as we found that all the medical residents, 12.5 % of the medical specialist doctors, and 21.27 % of the primary care physicians gave a positive answer at this question ($\chi^2=2.95$, $p=0.22$, in Fisher exact probability test).

More than half of the participants (52.17 %) considered that AI-based applications in Gastroenterology equally imply both advantages and disadvantages. However, most of the respondents pointed out that the limited resources (finances, time, and trainers) and AI-specialized personnel could be possible sources of reduced use of AI-based applications in their field of activity. Also, almost half of the respondents stated that they had not previously attended scientific events (43.47 %) or were not planning to register for training courses (56.52 %). In addition, the participants highlighted that the lack of clinical judgment and empathy, security or algorithm errors, the expense of resources, and ethical issues could raise some concerns regarding the use of various applications based on AI that are available for Gastroenterology practice (fig. 3).

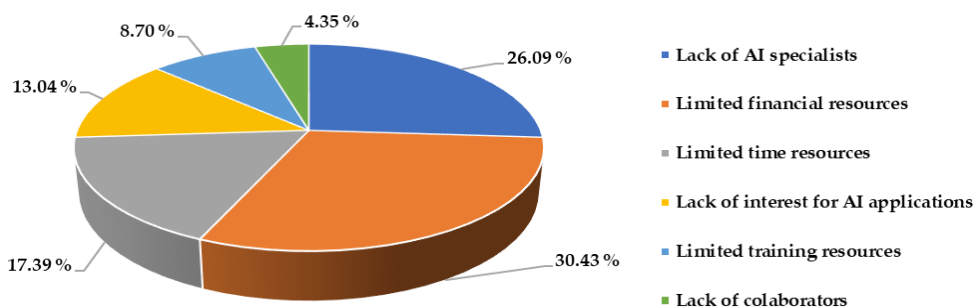


Fig. 3. Limitations of AI-based applications that are available for gastroenterology practice

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Nevertheless, 86.95 % of the participants suggested that AI-based applications used in Gastroenterology could lead to some discordance between algorithmic response and medical decision. Despite this, 91.3 % of the medical doctors that were interviewed are not concerned about the possibility of being replaced by AI in their field. Our results showed that the age (OR=1.1798, 95% CI=(1.0393, 1.3394), $p=0.01$) of the participants significantly contributed to the stratification of the results in terms of the possibility of being replaced by AI in the field. Moreover, we observed that men are more likely to report this possibility, as compared to women, but not in a significant manner (OR=1.3333, 95% CI=(0.3639, 4.8848), $p > 0.05$). Also, we observed that neither medical residents, nor primary care physicians positively responded to this item (Fisher exact probability test not performed). In this context, most of the participants agreed that AI-based applications could be useful in diagnosis and treatment. However, the need for human validation was repeatedly mentioned in the situation of receiving AI-based suggestions on differential diagnosis, paraclinical investigations, and drug interactions. Moreover, some of the participants highlighted that these suggestions would not be as useful as predicted if a dichotomous response is present when the medical decision implies temporization or prioritization rather than a choice between action and non-action.

DISCUSSION

Healthcare is currently one of the most important branches in our society, and thus continuous development to improve diagnosis and treatment is needed. Together with the development of AI technology in the last decade, many solutions also address the

medical care. In this way, as Gastroenterology also vastly benefited from AI-based solutions in paraclinical investigation, diagnosis, and treatment, we aimed to evaluate the perception of gastroenterologists regarding the extension of AI-based solutions used in their field. The results of our survey showed that, in contrast to previous similar studies, the participants recently gained more knowledge regarding the general understanding of AI (as seen in daily use) and in their area of expertise. However, this perception improvement did not significantly change the opinion of the participants on the advantages and disadvantages of daily life and professional AI-based solutions, findings that were consistent with previous similar studies (22, 24, 25).

The IMDRF SaMD Working Group (26) initially described medical devices as tools to be used in prevention, diagnosis, and disease management (ranging from treatment monitoring to symptoms alleviation or life support). The implications of AI-based software in these healthcare endeavors are meant to bring important improvements in the speed, precision, and accuracy of the medical act. However, the majority of the participants agreed that human validation is needed when AI-based applications are used in medical care and that the medical decisions should only be attributed to the human involved in the medical act, regardless of the assistance of the AI. In accordance with this, a recent study that evaluated the opinion of the American public on triage or discharge decisions showed a clear preference for human medical professionals over an AI-based algorithm (27). With regards to the possibility of being replaced by AI in their domain, almost all the participants in our study expressed no concerns about this aspect, as they clearly pointed out that the lack

of empathy of the AI-based applications could possibly prevent this. Goldhahn *et al.* (28) described the patient inputs during the medical act as a variety of emotions, values, personal preferences, and non-verbal communication that could hardly be substituted by technology. In this context, recent efforts were made to improve AI-based technology used in healthcare to recognize and respond to the facial emotions of the users, especially in carebots and online platforms/apps for mental therapy (29). However, the most difficult challenge for AI-based solutions in healthcare is their implementation in daily clinical practice, instead of determining whether the technologies will be capable enough to prove their effectiveness (30-32). In the present study, most of the respondents noted that AI-based technology could be helpful in diagnosis and treatment, leading to significant improvements in the patient's life. In addition, a recent review suggested that by adding AI technology to the healthcare system, the expertise of medical personnel could be complemented and enhanced, thus contributing to improved service quality, patient outcomes, and system performance (33).

Lately, due to the fast progress of technology, many AI-based resources have successfully been implemented in Gastroenterology. For an instance, high-performance recognition software was technologically customized for real-time endoscopy, along with high-quality graphical interfaces (34,35). Despite the fact that these tools proved their utility, some arguments are brought by the manifestation of obsolete behavior in clinicians when AI-based technology advances in performance and quality. In this context, the refusal of healthcare workers to use AI-based resources could be explained due to inflexibility or a lack of AI

specialists, as seen in our study and also suggested by Quinn *et al.* (36) and Lambert *et al.* (37). Moreover, we identified that the lack of significant resources, such as financial support or time, could contribute to the limitation of AI-based solutions use during the medical act.

Regarding the possible errors that could occur during implementation and use, most of the participants in our study highlighted that AI-based solutions could be the source of some security issues. This limitation was documented by Pedro *et al.* (38) and solutions such as permanent evaluation and update of the software by technical engineers, as well as standard, logistic, and ethical guidelines for AI-based solution implementation in healthcare were proposed.

Some of the main limitations of the present study address the reduced number of participants, the complexity of the survey, and the focus on just one medical specialty. However, we are currently considering to further extend the number and the medical field of the recruited participants. Concursive with this, we aim to improve the survey to include more aspects of AI-based solution awareness, as the current form of the survey was an initial and a less complex design. AI-based solutions are of great variety throughout the medical fields, thus the survey could also evaluate some field-specific aspects. Consequently, this preliminary data could only provide more information regarding the awareness of medical workers involved in Gastroenterology and Hepatology area of expertise.

CONCLUSIONS

This study reflected the awareness of the recruited medical workers regarding the potential of the use of AI-based solutions as helpful tools in the medical field, offer-

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ing substantial advantages in both diagnosing patients' conditions and resolving their issues through the use of pre-established algorithms. However, AI-based solutions could need substantial resources, such as finances, time, and specialists, to provide the expected results. Nevertheless, AI-based solutions could be seen as valuable assets that could bring important improvements in the speed, precision, and accuracy of the medical act. However, AI-based solutions could require solid validation and thorough training of the users.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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