

Artificial intelligence and the caring relationship: ethical profiles

Rosagemma Ciliberti[1], *Valeria Schiavone*[2], *Linda Alfano*[1]

[1] Department of Health Sciences, University of Genoa, genoa, Italy; [2] Experice Laboratory, Paris 8 University, France

Abstract. Use of artificial intelligence (AI) in healthcare can offer multiple and discordant contributions. These technologies may enable health workers to reduce the time needed for routine bureaucratic activities, sometimes sterile and distracting regarding the interests of the sick person and allow them to increase the patient's listening space and willingness to engage in a caring relationship. On the other hand, this automated cognitive assistance may also reduce or undermine the relational skills and abilities of the healthcare staff themselves. For these reasons, the impact of AI on clinical care and the doctor-patient relationship requires careful ethical consideration. There is a need to develop ethical criteria to protect patients' self-determination, ensuring transparency, equality of opportunity, privacy and safety. Therefore, a primary focus should be on training healthcare personnel in technological, ethical and social issues. In addition, special attention should also be paid to enhancing ethical discussion in the training courses of engineers, computer scientists and developers, with particular reference to the impact of design in the application of technologies on humans. Finally, the authors emphasize the need to foster a growing awareness in the population of the opportunities and risks of new technologies.

Key words: Artificial Intelligence, black box, ethics of AI, doctor-patient relationships emerging technologies, opacity, machine learning

Introduction

Since the beginning of the third millennium, studies on artificial intelligence (AI) have revolutionised our everyday lives, perhaps not yet completely consciously for everyone.

The fields of application and areas of interest of new technologies have multiplied: from the automotive sector, with the realisation of the first self-driving cars, to finance, industry, health.

The increasing abundance of data combined with powerful algorithms and computing capacity have fostered the development of AI, as well as that of other technologies that are considered emblematic of the Fourth Industrial Revolution (the Internet of Things (loT, robotics, quantum computers, 3D printing, genetic engineering...) (1).

The rapid evolution of progression of research, through the crisis of the "computationalist paradigm", has led to build systems that we might describe as almost "humanly intelligent," that is, capable of handling contingent interactions with the environment, arising not from the mere function of computation and processing of prior data, but from real learning capabilities such as to generate heuristic responses to the achievement of specific goals (2, 3) . In fact, AI doesn't follow a linear path, predetermined or predeterminable by software, and predictable according to the algorithms from which it is composed, but rather relies on a logic of self-learning, based on previous experiences of the machine itself, or provided by the surrounding environment (cd Deep learning). This machine learning is based on the so-called artificial neural networks, inspired by the neuronal architecture model of the hu-

man encephalic cortex, built on computational models that allow for unforeseen and unpredictable machine reactions, which are, therefore, beyond the control of the human programmer.

A foundation of this approach, both scientific and philosophical, comes to us from the work of Francisco Varela, a philosopher and neuroscientist who developed the concept of "enactivism" (4). In one of his major works "Invitation aux sciences cognitives" ("Invitation to cognitive sciences"), Varela writes: "The fundamental idea is that the cognitive faculties are intrinsically connected to the history of experience, just as a path, previously non-existent, appears by walking. The resulting image of cognition is not the solving of problems through representations, but an emergence process which creates a world" (5). Without going into the merits of the concept of enactivism in the neuroscientific sense here, at the risk of straying from our topic, it is enough for us to understand its fundamental character related, in Varela's own work, to artificial intelligence, which, modeled after human intelligence, would trace new ways of cognition and heuristic responses that were previously non-existent, in the encounter between the contingent stimuli of the environment and one's own previous. In 2009, an interesting paper was published with the title in which the authors, while adhering to the interesting enactivist proposal of self-productive interaction with the environment, enrich its perspective by strongly arguing for the need to "always integrate the human being to this environment for a relevant meaning construction in the context of a participatory artificial intelligence" (6).

In the medical field, too, the use of AI is an emerging opportunity that promises to request a veritable Copernican revolution in the traditional care relationship between physicians, other medical staff and patients.

It is, in fact, increasingly common in the hospital setting to use machines that intervene and take the place of the professional in the process of care, both in the executive and diagnostic phases, allowing practitioners to achieve more precise and effective results, while at the same time leaving aside the responsibility of the physician.

There are several rating scales that measure different levels of autonomy of machines from human control based on the intensity of involvement of the machine itself in interaction with the person, also for the purpose of identifying responsibility in case of harmful events (7).

Among them is the scale of Guang-Zhong Yang, dean of the Institute of Medical Robotics at Shanghai Jiao Tong University, which defines six increasing levels of autonomy, equivalent to those of self-driving cars.

In the case of surgical robotics, level "zero" corresponds to a tele-operated system fully guided by the surgeon (as is the case in the "da Vinci" unit for laparoscopic operations, where the surgeon has direct control of the entire procedure). At level-1, the robot can provide cognitive and physical assistance, by correcting the surgeon's movements, but the surgeon retains control of the system by being able to override these corrections (so-called virtual fixtures). At level-2, the robot possesses limited autonomy on some tasks, but still under the supervision and monitoring of the user who can neutralize the robotic execution. At level-3, the machine performs tasks autonomously but only following prior authorization by the surgeon. The higher levels are characterized by increasing autonomy of the robot, that can plan and execute a sequence of surgical tasks like a surgeon, until, in the highest level, it becomes fully autonomous, even in unforeseen and emergency cases (8, 9).

These systems, whose types of behaviour can no longer be defined by a programming code, continually redefine themselves and reproduce themselves independently, as if they were true autopoietic and enactive systems.

While such systems appear, on the one hand to be the most interesting and promising, on the other hand they appear to be burdened by the so-called "Black Box," that is, the problems associated with the internal opacity in Machine Learning that does not allow for a transparent and explainable explanation of how AI models get to a decision, even by the person who designed them.

This connotation of inaccessibility to the "discussion pathway" adopted by the device implies a limited knowledge and verifiability of the entire process capable of significantly undermining the overall reliability of the system, even with a possible exclusion of the health worker from the care relationship.

The possibility of machines to make autonomous choices independent of human command, along with complex legal issues, raises important ethical dilemmas about their nature and their correlation with a broader human phenomenology (10).

There is no doubt that the use of AI recalls the controversial ethical relationship between scientific knowledge and its applications, between nature and culture, which has long been the subject of attention and debate in both philosophical and scientific circles.

Multiple historical events have definitively renounced the idea of the neutrality of science; significant in this regard is the expression used by J. Robert Oppenheimer, who, after contributing to the development of the atomic bomb, defined the use of nuclear energy in the military as "loss of innocence of science" (11).

As the leading exponent of ontological and phenomenological existentialism Martin Heidegger already predicted in the middle of the last century, "Everywhere we remain unfree and chained to technology, whether we passionately affirm or deny it. But we are delivered over to it in the worst possible way when we regard it as something neutral; for this conception of it, to which today we particularly like to do homage, would make us utterly blind to the essence of technology itself" (12).

Indeed, the many applications of scientific knowledge, for virtuous or immoral purposes, cannot disregard a moral evaluation, respectful of human values, which certainly invalidates the uncritical acceptance of such supposed neutrality.

A bioethical reflection, necessarily based on a preliminary and thorough knowledge of robotic technology, is also inescapable in the field of the application in the medical field of AI.

The functional characteristics of the machine, the level of synergy and autonomy with and from humans, the areas of use of AI itself, but also the purpose for which it was designed, are important elements for the elaboration of a careful ethical evaluation.

Certainly, the main concerns are about the use of technology in those areas that are most beyond human control.

In this regard it is noted, moreover correctly, that the problem should not be set on whether or not such technology is permissible, but rather on "how" to make it permissible, since there is no automatic opposition between the autonomous machine and an ethics of values (13).

In particular, in health care, the ethical principles of responsibility and prudence are essential guiding references to ensure the primary goal of protecting patient safety and health (14).

IA and Medicine

The use of AI in medicine, as outlined in the European Commission's White Paper (2020) is significantly changing, and in part has already changed, all areas of study, research, and health care, fostering the development of new drugs, earlier prevention, more timely and effective diagnosis, treatment, and the development of clinical care tailored to the uniqueness of the individual patient (15, 16).

The use of advanced AI is widespread in so-called DTx, i.e., digital therapies (such as Oleena for cancer patients, Insulin in the treatment of diabetes, and Deprexis and Reser in the treatment of depression) that offer therapeutic interventions entirely guided by applications using sophisticated algorithms to prevent and treat the patient's pathological, physical or mental conditions.

The study by Esteva et al. published in Nature in 2017, shows that AI-based systems can classify skin cancer with a level of expertise comparable to that of experienced dermatologists (17).

In addition, these technologies can also be used in the automation and bureaucratic and administrative management of certain clinical steps, improving efficiency, accessibility, reducing the expense of managing health data and medical records, allowing more resources, in terms of money and also time, to be allocated to prevention, biomedical research and care.

The possibility to delegate more and more of the "routine tasks" can allow health-care workers to optimize time and be more available in the patient care relationship and with the whole health team, avoiding errors, rather than carrying out mere bureaucracy; it can also reduce phenomena of burn out and stress, improving the quality of work, with greater personal sat-

isfaction and more adequate management of required performance.

Last but not least, it is important to consider how AI made decisive contribution to the fight against SARS Co-V-2 virus, both in the diagnostic phase and in the management of the overt disease and, again, in the prediction of the evolution of pandemic trends epidemiological trends (18). But the potential that AI can offer the world of the helping professions is much broader.

In the near future, an administrative tutor could also be a health-care robot, which could support the dependent person not only in health care but also in the protection of property interests and existential issues (19).

This irreversible and unstoppable growth, that has led to important successes and significant new opportunities, comes with fears and risks of these innovations, destined to strongly impact the health care structure, the functions of the health care professions and the role of physicians and even more the very essence of medicine emerge that are (20, 21).

One of the most critical ethical issues concerns the impact of AI on therapeutic delivery and, more generally, on the relationship of care and trust between caregivers and health care providers (22).

In fact, the inherent opacity of AI risks significantly interfering with this relationship and specific health and medical decisions, as the lack of understanding and consequent lack of critical scrutiny of the outcomes produced by the use of AI, could marginalize the physician's role.

Closely related is the problem of cognitive bias arising from programming on a data sample that is not sufficiently representative of the whole concerned population and, therefore, inadequate to identify the most correct health care services and cause of possible damage to patients' health and lives. For example, a predictive algorithm based on chromosomal analysis can lead to errors if applied to populations whose genetic information is not available. It has happened in the past that the data used to train a particular system dedicated to the diagnosis of skin cancers belonged to Australian, European, and North American populations, characterized then by light skin. From this perspective, the system that had achieved high levels of accuracy for such populations, presented severe criticalities when applied to other ethnic groups (15).

Other similar biases occurred in the field of gender medicine, which for years used only the male pattern as a reference standard.

Evolutions in care relationship and treatment pathway

In a bygone era, the profession of the physician was conducted primarily at the bedside of the patient.

The relationship was typically dual: physician and patient. Other professionals rarely intervened and, in any case, it was always the trusted physician who played not only a central role but also an exclusive reference. The focus of the relationship lay in human contact, in the doctor's ability to observe the person, posture, attitudes, nonverbal language and examine his or her body through his or her own senses as well, in the ability of the human hand to touch, diagnose, treat. It was a kind of ritual, a clear message that enshrined a kind of alliance between doctors and patients.

Modern medicine has radically affected the duality of the relationship by enriching it with a plurality of components in the perspective of a multidimensional approach (23).

The classic doctor-patient pair is now replaced by the more complex health-care workers team-patient that, in the richness of the composition of skills and knowledge, also produces possible criticalities if disharmonies are present that may cause disorientation or lack of clear references in the patient.

Even the traditional medical examination, centered on eye and physical contact is often replaced by a briefing around a computer, in a confined space, during which images on screens, x-rays, reports, numbers, data are examined. The patient has become almost an icon, the recipient of excellent care, but devoid of his or her own reality and perhaps necessity.

The risk is to lose not only the human dimension of the relationship between doctor and patient, but to increasingly exclude the distinctiveness of the clinical dimension in diagnosis and treatment. Clinical semeiotics involves interactive processes and true hermeneutics of the patient's linguistic and bodily semantics that appear difficult to replace by an intelligence other than human.

At the same time, profound social and cultural changes have long since sharply dimensioned that centrality that the physician had in the Hippocratic perspective that was expressed in unconditional and unquestioned reliance, based on the physician's asserted superiority, in favour of a shared vision that recognizes the person's right to evaluate and decide his or her own good.

The advent of the Web 2.0 phenomenon, in the traditional "dyadic" relationship between doctor and patient has further injected innovative elements, by adding the so-called. Doctor Google, with all the possible distortions and deviations that it takes with it: confusing elements, cognitions not adequate to the specificity of the case, unnecessary alarmism, false hopes (24, 25). Never as in recent years have the opinion and advice of the doctor been refuted and not accepted (26).

The advent of AI introduces another figure into an already highly articulated system of professionals intervening in care, requiring innovative proposals by the European Parliament for "recognition of the electronic personality of robots that make autonomous decisions or interact independently with third parties" (27).

On this basis, it has also come to be envisaged that robots, especially those with more advanced technology, could be considered as electronic persons, that should be called in to compensate the damage suffered, through an asset to be reserved for the application of AI for this purpose. This hypothesis would in effect entail the introduction of the legal and professional figure of the robotic healthcare professional, as a member of the medical team (28).

From the standpoint of the traditional care relationship, this figure could further reduce the role of the physician as the main actor in outlining the treatment path and in accompanying the patient to informed and responsible therapeutic choices. The problem, already mentioned, of the "black box," shows the practitioner's inability to verify the system's logical process and rationale for choices, given that he or she operates by statistical inference, not deduction (29).

On the basis of the same information about the patient, it really may happen that the physician on one side and the AI on the other arrive at different diagnoses, making the decision on how to proceed problematic. For instance, AI could determine, with high probability, that the lesion may be a melanoma and thus prospect the indication for removal surgery, not necessarily shared by the physician (15). This opacity has clear and significant repercussions that affect the therapeutic relationship and, particularly, the ethical principle of beneficence and non-maleficence.

As pointed out by Italian Committee for Bioethics, the unintelligibility of the process by which an AI system arrives at proposing a particular diagnostic or therapeutic option may inhibit the physician from making autonomous evaluations and taking decisions other than those suggested by the machine (30).

Of course, the problem of "who" to rely on does not only concern the operator, but involves the patient as well.

The health-care operator might decide to disregard the outcome, adopting a critical scrutiny of the AI's work. This approach is coherent with what is indicated by Article 22 of the GDPR, which recognizes the data subject's right "not to be subjected to a decision based solely on automated processing (...) that significantly affects his or her person" (31). This approach, however, places the risks and responsibility of making a decision in the hands of the physician, as opposed to the opacity mentioned above.

Conversely, aprioristic prioritization of the machine would mean running into alarming drifts of dogmatism and shifting the paternalism paradigm from medical to AI.

Opposing to an automated decision may also be difficult, because the ongoing interaction with learning systems that contribute to the improvement of one's skills and competencies may contribute to the development of disproportionate trust toward the system's capabilities and suggested output. Delegating the decision to the machine may, not only result in a loss of human focus and a flattening of the physician's function to the AI output, in a dangerous phenomenon of deskilling, but also generate a psychological mechanism of de-empowerment and delegation from natural intelligence to artificial intelligence, with related legal consequences all to be considered (32, 33).

At the same time, the autonomy of the patient is also likely to be undermined, since in the absence of a clear prospect of a reliable diagnostic-therapeutic sce-

nario, patients may find it difficult to understand and evaluate the reasons for drawing a particular conclusion.

Nor can the risk be overlooked that the algorithm may order the available options, according to a hierarchy of values that does not conform to the cultural, anthropological, and existential principles of the patient. For example, the algorithm might be set to indicate a pathway that prefers greater life expectancy, thus preferring quantity over quality of time, while the patient might instead desire the opposite (15). Likewise, algorithms could thus steer toward medical practices that meet administrative and/or economic goals, rather than care needs.

Nor can be neglected paradoxical effects that might lead some people to be refractory to new methods of care, and other people to express a not houghtful and responsible consent.

Such critical issues about the explicability of the pathway have also provoked a denialist hypothesis that excludes on the part of the doctor, in the case of AI use, the obligation to inform, the patient about the use and mode of use of such technology (34).

An increasing production of documents underscores the respect for the ethical and legal principles inherent in this matter (35, 36).

In Italy, the document of the Presidency of the Council, while acknowledging the critical issues related to the construction of informed consent in the use of AI, expressly states that "it is an ethical and legal obligation that those who undergo such innovative health treatments through AI be informed in the most appropriate and comprehensible ways of what is happening, to be (if it is the case) subjected to experimentation and validation; to be aware that what is applied to them (diagnostically and therapeutically) implies benefits but also risks. It should be explicitly specified in the IC whether the treatments applied (diagnostic or therapeutic) come only from a machine (AI, Robot), whether and what are the areas and limits of human control or supervision of the machine" (30).

Likewise, in the Ministry of Health's document "Artificial Intelligence Systems as Diagnostic Support" (2021), it is considered imperative to extend disclosure to the use of new tools, including providing specific training for the physician and patient (37).

The possibility/capability to provide truly knowledgeable and in-depth information in a "black- box" context constitutes a certainly demanding challenge that requires the need to have peculiar and adequate regulatory tools and, also, a considerable effort of dialogue and confrontation between different professions and competences (bioethicists, jurists, programmers, computer scientists, developers of new technologies, risk assessment experts and physicians). Such an effort is more necessary than ever to ward off the danger of a "dehumanization" of the care relationship, that is, the loss of those connotations of attention to the singularity of the person being cared for, also in relation to his or her value and cultural references.

The criticalities inherent in the AI system certainly require great attention to the identification of the perimeter of information, which will certainly have to be flexible, calibrated, modulated, but not excluded.

A clear indication can be found in the Italian Law 219/2017 "Norms on informed consent and advance treatment provisions" which establish that information should be part of a relationship of "care" and "trust": a relationship that does not merely constitute a frame, the background (the setting) in which to insert the health treatment (intelligent or not), but that represents a tool of care (23).

This call for a relationship of care and trust (both fundamental terms in medicine) implies the need to maintain the humanity and closeness of the relationship with the patient, which cannot be delegated to the intelligent system, as well as to preserve the fundamental role of the specificity of the relationship.

The provision in Italian Law 219/2017 stating that "Communication time is care time" is a clear directive in this regard.

Conclusions

Ethical issues arising from the application of AI in medicine require timely examination and interdisciplinary debate aimed at sharing perspectives, awareness, limitations, and solutions for the development of medicine that is equitable, human, and respectful of human rights.

To achieve this goal, it is indispensable to rethink the education of health professionals in a dynamic way

by also introducing ethical knowledge not only in the curricula of health professionals but also in the degree programs of technical professions (engineers, computer scientists, developers).

Strategies and policies that break down fences between knowledge and skills with respect to the management of a technology that, currently used limitedly compared to its potential, is destined to increasingly change the essence of medicine in the not-too-distant future are indispensable.

Therefore, the question is to develop a different cultural approach, capable of composing the relationship between technologies and care needs in order to take advantage of high value-added tools, oriented to people's real needs and respect for dignity and free choice.

A disclosure / conflict of interest statement

None of the authors of this manuscript has a financial or personal relationship with other people or organizations that could inappropriately influence or bias the content of the paper.
It is to precisely state that "No Competing interests are at stake and there is No Conflict of Interest" with other people or organizations that could inappropriately influence the content of the paper.

References

1. Oosthuizen RM. The Fourth Industrial Revolution–Smart Technology, Artificial Intelligence, Robotics and Algorithms: Industrial Psychologists in Future Workplaces. Front Artif Intell 2022; 5. https://www.frontiersin.org/articles/10.3389/frai.2022.913168/full.
2. Ceruti M, Damiano L. Conoscenza della conoscenza e complessità. La proposta epistemologica di Varela per la scienza cognitiva. Rivista di estetica 2008; 37:67–76.
3. Xu Y, Liu X, Cao X, Huang C, Liu E, Qian S. et al. Artificial intelligence: A powerful paradigm for scientific research. The Innovation 2021; 2(4):100179.
4. Varela FJ. Thompson E, Rosch E. The embodied mind. Cambridge- Massachusetts: The MIT Press; 1991.
5. Varela F. Invitations aux sciences cognitives. Parigi: Edition du Seuil 1988:111.
6. De Loor P, Manac'h K, Tisseau J. Enaction Based Artificial Intelligence: What about Human in the Loop, in Minds and Machines 2009; 19:319–43.
7. Pasasuram R, Wickens CD, Sheridan TB. A model for types and level of human interaction with automation. IEEE Trans Syst Man Cybern A Syst Hum 2000; 30(3):286–97.
8. Biancardo A. Problematiche etico giuridiche relative all'utilizzo dell'intelligenza artificiale in ambito sanitario. Milano: Vita e Pensiero; 2021.
9. Attanasio Aleks, Scaglioni B, De Momi E, Fiorini P, Valdastri P. Autonomy in Surgical Robotics. Annu rev control robot 2021; 4(1):651–79.
10. Li F, Ruijs N, Lu Y. Ethics & AI: A Systematic Review on Ethical Concerns and Related Strategies for Designing with AI in Healthcare. AI 2023; 4(1):28-53.
11. Capri AZ. From Quanta to Quarks. More anecdotal history of physics. Singapore: World Scientific Publishing Co. PTE.LTD; 2007:70–86.
12. Heidegger M. The Question Concerning Technology and Other Essays. New York & London: Garland Publishing INC; 1977:4.
13. Scaffardi L. La medicina alla prova dell'Intelligenza. DPCE 2022; 51(1). https://www.dpceonline.it/index.php/dpceonline/article/view/1578
14. Patuzzo S, De Stefano F, Ciliberti R. The Italian code of medical deontology. Historical, ethical and legal issues. Acta Biomed 2018; 89(2): 15–64.
15. Mannelli C. Etica e Intelligenza artificiale. Il caso sanitario. Roma: Donzelli Editore; 2022.
16. Topol EJ. High-performance medicine: the convergence of human and artificial intelligence. Nat Med 2019; 25:44–56.
17. Esteva A, Kuprel B, Novoa RA, Ko J, Swetter SM, Blau HM, Thrun S. Dermatologist-level classification of skin cancer with deep neural networks. Nature 2017;542(7639):115–8. Erratum in: Nature 2017;546(7660):686.
18. Jain G, Mittal D, Thakur D, Mittal MK. A deep learning approach to detect Covid-19 coronavirus with X-Ray images. BBE 2020;40(4):1391–405.
19. Cortellessa G, De Benedictis, R, Fracasso F, Orlandini A, Umbrico A, Cesta A. AI and robotics to help older adults: Revisiting projects in search of lessons learned. Paladyn, J 2021; 12(1):356–78.
20. Lee D, Yoon SN. Application of Artificial Intelligence-Based Technologies in the Healthcare Industry: Opportunities and Challenges. IJERPH 2021;18(1):271.
21. Ahuja AS. The impact of artificial intelligence in medicine on the future role of the physician. PeerJ 2019; 4;7:e7702.
22. Aminololama-Shakeri S, López JE. The Doctor-Patient Relationship with Artificial Intelligence. AJR Am J Roentgenol 2019; 212(2):308–10.
23. Ciliberti R, Gulino M, Gorini I. New Italian law about end of life: Self-determination and shared care pathway. [La nuova normativa Italiana sul fine vita: L'autodeterminazione e la condivisione del percorso di cura]. Recenti Prog Med 2018; 109 (5): 267–71.
24. Huisman M, Joye S, Biltereyst D. Searching for Health: Doctor Google and the Shifting Dynamics of the Middle-Aged and Older Adult Patient–Physician Relationship and Interaction. HAH 2020; 32(9), 998–1007.
25. Van Riel N, Auwerx K, Debbaut P, Van Hees S, Schoenmakers B. The effect of Dr Google on doctor-patient encounters in primary care: a quantitative, observational, cross-section-

al study. BJGP Open 2017;1(2):bjgpopen17X100833.
26. Freckelton R. QC, Internet Disruptions in the Doctor–Patient Relationship. Med L Rev 2020; 28(3):502–25.
27. Risoluzione del Parlamento europeo del 16 febbraio 2017 recante raccomandazioni alla Commissione concernenti norme di diritto civile sulla robotica (2015/2103(INL). https://eur-lex.europa.eu/legal-content/IT/TXT/PDF/?uri=CELEX:52017IP0051&from=DE
28. Teubner G. Soggetti giuridici digitali? Sullo status privatistico degli agenti software autonomi. Edizioni Scientifiche italiane: Napoli; 2019.
29. Smith H. Clinical AI: opacity, accountability, responsibility and liability, in AI&Society 2021; 36:535-545.
30. Comitato Nazionale di Bioetica, Comitato Nazionale per la Biosicurezza le Biotecnologie e le Scienze della Vita. Presidenza del Consiglio dei Ministri. Intelligenza artificiale e medicina: aspetti etici. 29.05.2020. https://bioetica.governo.it/it/pareri/pareri-gruppo-misto-cnbcnbbsv/intelligenza-artificiale-e-medicina-aspetti-etici/
31. General Data Protection Regulation (OJ L 119, 04.05.2016). https://gdpr-info.eu
32. Arnold M. Teasing out AI in medicine: an ethical critique of AI and machine learning in medicine. J Bioeth Inq 2021;18: 121–39.
33. Pasquale F. New laws of robotics. Defending human expertise in the age of AI. Harvard (MA): Harvad University Press; 2020.
34. Cohen G. Informed Consent and Medical Artificial Intelligence: What to Tell the Patient, in Geo L J 2020; 1426–69.
35. WHO Guidance. Ethics and governance of artificial intelligence for health. 28 June 2021. https://www.who.int/publications/i/item/9789240029200
36. Unesco. Recommendation on the Ethics of Artificial Intelligence. SHS/BIO/PI/2021/1. 2022. https://unesdoc.unesco.org/ark:/48223/pf0000381137.
37. Ministero della Salute. I sistemi di intelligenza artificiale come supporto alla diagnostica. 2021 https://www.salute.gov.it/imgs/C_17_pubblicazioni_3218_allegato.pdf.

Corresponding author:
Rosagemma Ciliberti, Department of Health Science, University of Genoa, Genoa, Italy,
Email: rosellaciliberti@yahoo.it