

# Reshaping the Patient-Physician Relationship through Artificial Intelligence in Medicine? -Promises, Opportunities, and Ethical Challenges

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## Abstract

With the rapid development of AI in medicine, it is to be expected that new asymmetries will arise in the doctor-patient relationship and normative terms such as patient autonomy, paternalism, trust, and confidentiality will acquire new meanings and functions. All of these developments will create new and complex ethical questions. Some of these questions will be analyzed and reflected in this article. It is argued that if AI improves healthcare and promotes the well-being of the patient - without violating the fundamental rights of others - it must be viewed as morally right and should not be fundamentally rejected. On the other hand, it should also be reflected what will be changed by the application of AI in healthcare and whether these changes are desirable, legally appropriate, and ethically justifiable. Therefore, we need investigations from the perspective of ethics and other humanities to go along with the establishment of AI applications in medicine simultaneously and not after the event.

**Key words** : AI in Medicine, Medical Ethics, Patient-Physician Relationship, Autonomy, Asymmetry, Trust, Confidentiality

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## 1. Introduction

Since the 17<sup>th</sup> century, there have been many important inventions in the history of medicine that have changed diagnostic methods and therapeutic interventions in the course of time. For instance, the invention of microscope in the 17<sup>th</sup> century played an important role for a subsequent paradigm shift in the medicine. Among other developments, the traditional theory of humoral pathology, dating back well over 2000 years, was replaced by cellular pathology in the 19<sup>th</sup> century. Especially over the last century, we have witnessed the emergence of many new revolutionary diagnostic methods and therapeutic interventions in medicine (Porter 2011). Imaging techniques, antibiotics, organ transplantation, genome research, and intensive care units have not only increased the average life expectancy, but have also contributed to improving the quality of life in many areas.

A common feature of these new diagnostic and therapeutic measures is that they also afford doctors new opportunities and possibilities in their daily professional life. Yet even while doctors benefit from these new technologies, in their decision-making they still use much of the knowledge acquired during medical education, information gained from the scientific literature, and personal experience accumulated through

many years of professional practice. However, according to what some experts predict, the use of artificial intelligence in medicine will change doctors' established ways of thinking and working and may remodel the conventional patient-physician relationship (Aminololama-Shakeri & Lopez 2018). In this context, it is important to ask which kind of change the use of AI in medicine will produce (van Rysewyk 2015). Will the diagnostic, therapeutic, and prognostic procedures be fundamentally revolutionized? Will AI influence the doctor-patient relationship and if so, how? Will it affect our understanding of health and illness? Will the self-image of the doctor and other healthcare professionals be remodelled through these changes?

As we are finding ourselves at the beginning of these developments, it is obvious that we cannot have answers to all these questions with any great degree of certainty. Therefore, it is also very difficult to assess the ethical dimensions of prospective interventions and developments. However, in the light of current research projects and certain interventions being trialed, we are able to make certain predictions that allow us some degree of ethical analysis. In this article, I will investigate the meaning of possible changes in the patient-physician relationship through the use of AI in medicine. I will also focus on the moral aspects of these changes and their ethical analysis and assessment.

## 2. Promises, Possibilities and Boundaries of AI Use in Medicine

It can be predicted that in some areas of medicine, such as radiology (van Assen et al. 2020; Duong MT 2020), dermatology (Gomolin et al. 2020), pathology (Rakha et al. 2020), emergency medicine (Sangil Lee et al. 2019), and also intensive care medicine (Guillermo Gutierrez 2020), AI tools will find an increasing range of applications (McKinsey Global Institute 2017; Miller & Brown 2018; Jalal et al. 2019; Lin et al. 2019; Lynn 2019). Detecting certain diseases on the basis of radiological patterns or diagnosing certain cancers of the skin through AI are no longer distant dreams for the future (Haensle et al. 2018). Furthermore, material for pathological examination is increasingly being digitized; therefore, artificial intelligence offering additional analytical information could be a valuable aid in everyday routine diagnostics and therapy planning. The first research projects in these areas are already underway, even though as yet there is no established area-wide application available (Hosny et al. 2018).

Even if in the general discussion the difference between IT applications and AI does not appear that big on a technical level, it is very important to distinguish between these two approaches from an ethical point of view: The use of AI should not be equated with the use of IT in medicine. There are not only technical differences, but ethically speaking, AI is quite particular. Conventional use of IT in medicine involves possibilities of far more comprehensive collection, storage, and exchange or retrieval of data as well as rapid access to scientific information in databases or through search engines. Likewise, telemedicine applications are made possible by using modern communication technologies (Dahlke & Ilkilic 2020). The use of artificial intelligence,

on the other hand, allows for more than storing and retrieving relevant information. Through an appropriate training phase, for example, machines can learn to identify a particular spot on an X-ray image or a specific pattern on the skin as a sign of a disease. As we are dealing with reading a bodily status as a diagnosis of a disease, this difference has not only a technical dimension but is also of ethical importance. German medical anthropologist Fritz Hartmann called a diagnosis “a pathological category of existence” (Hartman 1984, p. 11). If we think of a cancer diagnosis, for example, this may be the main turning point in a person’s biography. Thus, this diagnostic identification has individual, social, and economic consequences and therefore includes ethical dimensions (Currie et al. 2020).

With the use of AI, it is also possible to make better prognoses (Lal 2020). This predictive information, ruling over the patient’s future, would have serious ethical implications. But before a machine can reach such a result, many pieces of information and signs have to be entered on many levels, and this information has to be processed through different algorithms. What we are talking about here is machine learning (ML), which is defined as using algorithms and statistical models in order to perform a specific task effectively without using explicit instructions (<https://github.com/surajdurgesh/Machine-Learning-Lab#readme>, accessed 09/09/2020). Two types of learning systems are involved in machine learning: supervised and unsupervised machine learning. In supervised learning, professionals control and correct every step. In unsupervised learning, on the other hand, algorithms look for patterns in the data without humans instructing them what to look for. They then recognize similarities that they cluster automatically. Unsupervised learning is particularly exciting for applications in situations where people

do not know what to look for (<https://searchenterpriseai.techtarget.com/definition/unsupervised-learning>, accessed 09/09/2020).

Identifying the ethical problems entailed in the use of AI requires the determination of the specific areas of application of AI in the field of medicine. In this context, we can imagine two scenarios for this application. As mentioned above, the first scenario focuses on applications in specific medical disciplines in the form of diagnosis, prognosis, or recommendation of certain therapies. Some applications already exist today, and many new ventures are being developed in numerous research projects, giving us reason to assume that they will lead to more extensive uses in the foreseeable future (Obermeyer & Emanuel 2016). The second scenario would be the complete replacement of the physician by a “Robodoc”: listening to the patient, carrying out physical examinations, writing prescriptions, giving health recommendations and, if necessary, performing surgical operations. Taking into account the current rapid development of artificial intelligence, it seems that these medical services may become available at some future point in time, though they are not expected to be implemented successfully in the nearer future.

Given that the second scenario is not likely to be possible any time soon, I will focus on the first variant. From an ethical perspective, it makes sense to ask what possibilities, opportunities, and risks are to be expected due to the application of AI. How can AI change and reshape the classical doctor-patient relationship? What would be the ethical significance of these changes and new shapes?

### 3. The Patient-Physician Relationship in the area of AI

The continuously increasing use of AI will not be without consequences in medicine. For the physicians, their knowledge acquired in medical education and their experiences will lose their previously pivotal importance, because they are quickly replaced and superseded by new research results. AI machines will also evaluate other physicians' experience and be able to implement them in their algorithms. In sum, the physician's medical experience collected over decades of practice will not have the same high importance as it has now.

These and other developments will change the doctors' traditional authority. They will no longer be - as they used to - the masters of medical knowledge and medical experience. Their current knowledge and thus their competence can be quickly overtaken, creating a need to be constantly updated by AI machines. This entire development will change the classical form of trust in the physician and lead to the emergence of new asymmetries in the doctor-patient relationship, whereby the doctor no longer possesses the highest level of knowledge but is merely an expert who uses knowledge produced by AI machines. For the ethical evaluation of AI practices, it is important to ask how AI will affect normative terms like confidence or the asymmetrical relationship between the expert and the patient. Will this kind of relationship be more paternalistic or will it give more autonomy to the patient?

#### 3.1. Asymmetry

There is a consensus among medical ethicists about the asymmetric character of the patient-doctor relationship, shaped by the meeting of

two people whose situation, conditions and position are insurmountably different from each other's (Schöne-Seifert, 2007, pp. 89-96). Here, the patient is in pain and suffering, in need of help and in a weak position. The physician, on the other hand, is in a strong position, being equipped with medical knowledge, experience in diseases, and many technical solutions for diagnosis and treatment. In an intensive care unit or an operating theater, the patient may be in a semi-nude or completely nude state in front of the physician. He may be unconscious or in pain. The physician who comes to the patient's bedside for a visit on the ward stands upright, wearing a white coat and carrying his stethoscope around his neck as a symbol of his status and power, to the point that in some western languages, doctors are referred to as "Gods in white coats". This asymmetry is inherent in every patient-physician relationship, perhaps with some minor differences.

With the use of an AI machine in medicine, it will be important to ask how this asymmetry may be changed (Beil et al. 2019). Will the use of AI in healthcare increase the current asymmetry or will it create new asymmetries in the patient-physician relationship? Assuming AI machines will be used very intensively in the process of diagnostics and therapeutics, the doctor would lose his leading role and relational power. Even if some authors tend to speak of the supporting function of AI for the doctor, the task and the image of the doctor will be reduced in this process, which inevitably means a loss of the physician's power. If the physician diverges from the recommendations given by the AI machines, he will have justify why he made this change. These possible developments might well bring about new asymmetries in the healthcare system with the advent of AI machines. If the dominance of AI machines is always visible in medical practice, there will inevitably be an asymmetric relationship



with three actors: the doctor, the patient, and the AI machine. On the other hand, we could think of a development where the patient can receive individual and targeted information from AI sources, similar to current general information sources on the Internet. This situation would then redraw the existing asymmetries. As a result, the patient could be much better informed than has been possible up until now, which could reduce existing asymmetries (Topol 2019). However, such a reduction in asymmetry will not be possible for every patient, given that evidently not everyone has the same skills and resources for using the Internet, especially when it comes to the elderly. These social and generation differences are expected to remain in existence for some time in the future, giving rise to various asymmetries in the patient-doctor relationship.

### 3.2. Trust and Confidentiality

Trust is the basis of every patient-physician relationship. The principle of trust is essential, especially at a potentially fateful moment in a patient's life, and in medical care we need the mutual trust between both sides. Three basic features should be considered in the context of a patient trusting his or her physician. The first element is the confidence in the physician's medical knowledge and skills. The patient should be certain that the physician has the necessary and sufficient education and experience in order to exercise this exceptional profession. The second important point of the patient's trust is that he needs to be sure that the physician will use his knowledge, skills and technical facilities in the patient's best interest. The third aspect is the conviction that the physician will treat all information about the patient and his or her disease as confidential (medical confidentiality).

The use of AI in the medical field is most likely to change this trust in the patient-physician relationship in many ways. In this process, we encounter different questions. One of the most important quandaries is if the patient will perceive the AI machine as a separate entity and develop a separate form of trust in it - or will he simply trust his doctor to use the AI machine correctly and appropriately? Potential trust in AI machines contains at least two dimensions: trust in the doctor and trust in him using these machines in healthcare properly. Therefore, experts in the subject strongly recommend that physicians should urgently learn how to use AI machines. Abhimanyu S. Ahuja from Florida Atlantic University writes: "While AI is unlikely to replace physicians in the foreseeable future, it is incumbent on medical professionals to learn both the fundamentals of AI technology as well as how AI-based solutions can help them at work in providing better outcomes to their patients. Or, it might come to pass that physicians who use AI might replace physicians who are unable to do so." (Ahuja 2019, pp.14-15). If we agree with these statements, trust in the physician will no longer increase in proportion to his knowledge and experience but with his ability to use AI machines correctly, inaugurating a completely new situation in the time-honored patient-doctor relation throughout the history of medicine.

In order for AI machines to be used successfully in medicine, the patient's data must be uploaded to the digital environment. Although patient data are being digitalized in many countries already, as of now these data are kept in relatively closed systems. With the use of AI, the patient's data will not remain within closed systems, but these data will necessarily be available to other international systems and networks that work with AI technologies. It will be impossible to determine and control

where and how this data will be used in these complex AI systems. It will also become almost impossible to erase one's own data confidentially and data sovereignty<sup>1)</sup> (German Ethics Council, 2017; Uçar & İlkılıç 2019; Wangmo et al. 2019; Safdar et al. 2020). Therefore, the patient's trust in the AI machines in medicine presupposes not only scientific reliability, but also a very good national and international level of data protection, which is not a trivial issue both technically and legally.

There is also another ethical problem arising around the subject of trust. Should the patient trust the IT experts, the IT companies that produce the AI machines, or should he trust the state that is implementing this technology in the healthcare system - or should he still trust the doctor who uses this technology. This could be called a "fragmentation of trust" in the healthcare system. This question adds to the problem areas discussed above, emphasizing that with the use of AI in healthcare, the concept of trust becomes increasingly complex, involving numerous new problems and challenges.

### 3.3. Models of the Patient Physician Relationship

Aside from terms such as asymmetry and trust discussed above, there are other important questions about how the application of AI will

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1) Data sovereignty as defined by the German Ethics Council is "the responsible shaping of informational freedom, in a manner appropriate to the risks and opportunities presented by big data. [It] is the central ethical and legal goal in confronting the challenges and opportunities presented by big data. [...] The notion of shaping informational freedom builds on the concept of informational self-determination. It is not grounded in exclusive rights analogous to property, but rather in each person's authority to determine with which content one chooses to relate to the wider world." (Deutscher Ethikrat 2017, p.30)

affect the patient-doctor relationship. In the literature on medical ethics, different models for the doctor-patient relationships are discussed (Emanuel & Emanuel 1992; Schöne-Seifert 2007). While there are different classifications being used, three models are of particular importance: the paternalistic model, the partnership model, and the customer model.

In the paternalist model, the ethical principles of beneficence and non-maleficence are preferred over patient autonomy. According to this approach, the physician is in a position to know what is best for his patient because of his knowledge and experience, and thus it is his role to decide with his paternal authority. According to this model, the meaning of the disease can be defined objectively and the physician can correctly evaluate the situation of the patient.

The partnership model is also defined as the deliberative model or the shared decision-making model in the literature. In this concept, the principle of autonomy is more prominent than in the paternalist model, centered on the idea that the patient makes a decision about himself after obtaining a sufficient amount of information. In this process, the patient's value system, including his or her religious and cultural values, are as important as the laboratory results. In this view, the physician accompanies and informs the patient like a friend and a partner.

In the customer model, the patient's decisions and requests for himself are at the forefront. The patient either has obtained the information he or she needs to make a decision previously or he receives this information from the physician before requesting a medical intervention. Based on this information, the patient takes the responsibility and makes a decision without further advice or recommendations from the physician. As is the case in elective plastic surgery, the physician is in the position

of a paid expert or a technician who fulfills the wishes of the person who spends money for the doctor's knowledge and expertise.

The impact of AI on these patient-physician relationship models will depend on many factors. Will AI strengthen one or the other existing model or will it create completely new relationships? One important criterion for answering these questions is whether AI will be no more than a support for medical decisions and actions taken by the physician.

If AI merely supports the doctors, two scenarios are possible. One version is that the doctor will become more effective in advising his patients thanks to AI. This might strengthen the partnership model. However, there is a second scenario that could be quite the opposite. The increased certainty of the doctor's knowledge would enable him to give far more precise recommendations, commanding greater respect from the patient on the basis of strong scientific power. The patient would thus feel compelled to obey the doctor's AI-based medical advice because this advice is far more powerful than the advice of the physician alone. In this case, we would see some sort of neo-paternalism that could be called *digital paternalism* in the doctor-patient relationship.

A third scenario is also conceivable, where the AI provides the patient direct and barrier-free access to medical information. If this option were available to every patient without censorship and at low cost, this would possibly strengthen the customer model. In such a case, the patient can bypass the doctor by entering his data into the electronic system and choose a therapy for himself. To a certain extent, this already happens today with the use of Google search. However, AI will be far more precise and personalized.

While it is often claimed in the scholarly literature that the use of AI will only be an aide for the doctor, the rise of a different and much

stronger AI application in the future cannot be excluded. Evidently, in such a situation there will be a competition between doctor and AI machines, transforming every doctor-patient relationship into a triangle with radically novel ethical dimensions.

In the pursuit of increased quality standards in healthcare, AI could even be used in a controller function. These applications would minimize the doctor's professional autonomy. If such controls were associated with determined consequences or restrictions, the doctor would no longer be free to decide according to his professional ethos and conscience, but would be tied to the quality standards of the AI.

In particular situations, today's doctor may diverge from the recommendations of professional medical guidelines for cultural and reasons. Even if this decision is at odds with the scientific facts, it can be defended with good ethical reasons. If in similar situations AI interferes uncritically and unchallenged with the doctor's decisions, it is to be feared that there will be hardly any room left for well-considered and ethically understandable decisions and actions (Vellido 2019). This situation would then reduce the doctor's actions to implementing scientific knowledge in practice, which is quite contrary to the art of medicine (Mittelman et al. 2018).

### 3.4. Morality of AI Decisions in the Health Care System

As soon as the AI machine becomes an integral part of medical care, we will have to discuss the doctor-patient-machine relationship (Jotterand & Bosco 2020). For the patient, this may mean that the doctor is no longer his most important and sole counterpart in this relationship. The physician would also not be the main protagonist when

it comes to relieving suffering or curing a disease. As a result, the asymmetry is not as it used to be, between doctor and patient, but on a doctor-AI machine-patient gradient. Will AI machines destroy the patient-physician relationship evolved over thousands of years? At this point, it can be legitimate to ask what the ethical significance of this change is. Can the operation of AI machines in medicine be understood as a moral act? Can AI machines be held morally responsible for their diagnoses and therapeutic recommendations?

We know that every medical treatment decision has an ethical aspect. Thus, a doctor constantly weighs between benefit and harm, even when simply prescribing aspirin or an antibiotic. The doctor will prescribe an antibiotic only if the benefit of its use clearly outweighs the undesired effects. Since the benefit-harm calculation is an integral part of any moral decision, practically every medical decision also entails an ethical judgment. However, if an illness is assessed by an AI machine and then an antibiotic is recommended, this decision has no ethical component in the actual constellation, because the ethical considerations for exactly this situation have been made much earlier, in the programming phase of the AI. In this sense, it is not the AI machine itself, but the programmers and scientists providing the basic knowledge to them to have made a moral decision.

A greater ethical problem is the contribution of AI machines to concrete decisions in complex medical situations, because decision-making regarding a therapy is more than just thinking along medical algorithms (Karches 2018). It is a decision for action and thus again contains a moral component. Therefore, numerous social, psychological, religious and other benefits and harms have to be considered, and the facts involved should be evaluated on the basis of an ethical concept. In this context, it

is legitimate to be sceptical whether it will be possible to make AI machines act ethically at this level (Biller-Andorno & Biller 2020). There are two basic reasons for doubt:

1. AI machines cannot think and act morally. They lack free will and freedom to act. As machines can have no will, they cannot have autonomy. A decision taken as a result of machine learning cannot be a result of free choice. Therefore, it is not a moral decision. All decisions made by AI machines are programming-based and algorithm-dependent decisions. Even decisions made through supervised and unsupervised learning are no free-will decisions.

2. The second difficulty lies in the structure of ethical decisions. Which ethical theory should be used in what form? It is well known that the different ethical theories in use can lead to different results. Should the AI machines be based on Deontological Ethics, Utilitarian Ethics, Virtue Ethics, or Christian, Jewish, Islamic, Buddhist or Confucian Ethics...? Of course, algorithms can be written for any of these choices, but the AI engines using these algorithms will never become a moral subject. Thus, the question of moral accountability remains an unsolved problem.

#### 4. Conclusions

The ethical assessment of AI use in healthcare is a complex endeavor and depends on many concomitant factors. Even though we can currently assume that the use of AI in healthcare will become more and more intensive, the possible developments cannot be predicted with any certainty. In the first parts of this article, some relevant issues regarding



the doctor-patient relationship have already been analyzed and discussed. A number of important questions seem to be crucial for an ethical evaluation: In which medical disciplines will AI be used more widely? Will it rather be used primarily for making diagnoses in visual areas or will it also be involved in treatment decisions in fields such as internal medicine and oncology? Will AI only provide up-to-date validated information for doctors and be a simple medical decision-making aid? Or will it be allowed to take certain decisions or even actions in particular areas like an autopilot on an airplane, maybe in surgical interventions? These questions appear to be central for a prospective ethical evaluation of health care use.

However, some areas and ethical issues in the doctor-patient relationship are most likely to be affected by the use of AI. First of all, the asymmetry in the relationship between patient and doctor will change depending on how AI is used. The central normative terms confidentiality and trust in the doctor will also be altered by the use of AI. The doctor-patient models will be changed and new forms of paternalism such as *digital paternalism* are likely to emerge. However, the entire development can strengthen the position of the patient and perhaps even make him much more autonomous in his decision-making compared to today, because he will have far easier access to crucial information by himself. Since we do not have experience with widespread use of AI as yet, these topics with the existential ethical questions they raise can only be addressed hypothetically. Therefore, it was tried in this paper to answer these questions based on certain assumptions.

Despite these ambiguities, some ethically relevant assessments can already be highlighted as conclusions here:

1. If a certain technology improves healthcare and promotes the well-being of the patient - without violating the fundamental rights of others - it must be viewed as morally right and should not be fundamentally rejected. Of course, avoiding the violation of the fundamental rights of others cannot be the only criterion for the application of AI in medicine. Rather, it is also very important during the improvement of diagnostic and therapeutic possibilities to consider other goods such as the quality of the doctor-patient relationship, trust in the doctor, and understanding professional self-perception. Likewise, human dimensions of medical treatment such as empathy, affection, compliance, and adherence are of unaltered important.

2. We should have enough foresight to analyse early on what will be changed by the application of AI in healthcare and whether these changes are desirable, legally appropriate, and ethically justifiable. Only a well-thought-out and balanced implementation can make the application of AI in medicine successful. This means that ethical research indispensably has to accompany the development and introduction of AI applications to medicine. Ethical research initiated after the establishment of AI applications in healthcare would only have remedial function, which is not recommendable. At this point, it is of utmost importance that all ethical research is carried out with an interdisciplinary concept in mind. The Humanities in AI offer themselves as a most suitable environment for this task.

3. Since citizens will be influenced by all the AI developments, easier access to information about AI applications should be made possible in a country. These important topics and involved questions requires an open discourse in society with the participation of as many citizens as possible. Space should also be created for social discourses

which are not guided by interests. This social discourse is too important to be left to politicians and scientists alone.

4. Another important issue that is currently not intensely discussed regarding the use of AI in medicine is the impact of AI on our understanding of health and disease. Such processes will ultimately also change our image of human beings and our self-image. The question of what this means in the short term and the long term should be the subject of further research in the humanities.

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