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Understanding the impact of Artificial Intelligence on physician-patient relationship: A revisitation of conventional relationship models in the light of new technological frontiers

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Abstract. The physician-patient relationship has undergone a transition throughout the ages. The introduction of Artificial Intelligence (AI) in recent years, however, is redefining this relationship. The four main relationship models described by Emanuel in 1992 are known as paternalistic, informative, interpretive, and deliberative. The aim of this study is to understand how conventional models of doctor-patient relationships are changing when considering the impact AI has on medical practice. The introduction of AI could strengthen the physician's role resulting in the so-called digital paternalism or even undermining the physician's role. Also, doctors and patients could experience decision paralysis when AIs' recommendations are difficult to understand or explain to patients and it may affect the organizational aspects of healthcare contexts. It becomes necessary to define the source of the information presented to the patient. On another hand, AI could increase the patient's trust in the doctor by knowing that various therapeutic choices are being discussed and fully explained. It's complicated to understand whether the trust relationship established between doctor and patient remains bi-univocal, by incorporating AI in the clinician's figure, or whether AI must be introduced as a separate entity implying an asymmetry in this relationship. Shared decision-making, guidelines and training, together with an effort in communication are fundamental to best incorporate AI into clinical practice. It is relevant to educate doctors on the new models of relationships that can be created, in addition to studying patient populations within the context of these models' framework.

Key words: Physician-Patient Relationship; Healthcare; Relationship models; Artificial Intelligence

Introduction

The physician-patient relationship (PPR) has been defined as "a consensual relationship in which the patient knowingly seeks the physician's assistance and in which the physician knowingly accepts the person as a patient" (1). This unique relationship encompasses 4 key elements: mutual knowledge, trust, loyalty, and regard (2). These elements reflect patients' enduring views about their relationship with the doctor outside of consultations. They appear to be the ongoing product of the dynamic aspects of the relationship

Establishing and maintaining this healing relationship is essential to providing effective care, and strong relationships can improve both a patient's health care experience and clinical outcomes also affecting the overall health care system (3).

The physician-patient relationship is not easily defined as it is shaped by several factors, such as patient's values and needs, patient autonomy, and physician disclosure of medical information. In order to understand the dynamic interaction between a patient and a physician there have been several attempts to frame and classify the various types of PPR that can

occur between the two actors (4). The aim of this study is to understand how conventional model of doctor-patient relationships discussed by Emanuel (8) are evolving when considering the impact AI has on medical practice. For each model analyzed, possible implementation scenarios will be discussed depending on the nature of the patient that a doctor encounters during clinical activity and consequently how AI affects, positively or negatively, the delicate balance between the two parties.

Materials and methods

A search of the literature of interest was conducted, which led to the identification of a lack of articles about the topic discussed.

Electronic databases including PubMed, Scopus, and Web of Science were used to search for the articles, integrating with a free search on web-based search engines.

Keywords including: "Artificial Intelligence" and the corresponding abbreviation "AI", "physician-patient relationship" and the alternatives "doctor-patient" and "clinician-patient", combined with the terms "model/s" were used to achieve relevant studies. A search was completed using AND and OR to combine the results that were found based on each keyword. The research resulted in 16 relevant contributions on the topic of the doctor-patient relationship and Artificial Intelligence, and these were integrated into the revisitation of the models described by Emanuel (8) in the light of the introduction of new technologies.

Physician-patient relationship models

In the 1950s Szasz and Hollender (5) identified three basic models of the doctor-patient relationship. These are activity-passivity, guidance-cooperation and mutual participation. The activity-passivity and guidance-cooperation models are predominantly doctor-centred, and the approach is paternalistic, elevating the figure of the physician as a healer to be completely trusted and who only acts in the interest of the patient's good, superseding the patient's autonomy in decision-making. The latter, mutual participation, has a greater emphasis on patient-centred medicine (6).

The rise of psychoanalytical and psychosocial theories in the late 19th Century began to further constitute the patient as a person. This therapeutic model meant that, in terms of the PPR, it was of great importance to listen to the patient thoroughly. The interest in the patient allowed physicians to develop a genuine communicative relationship and reintroduced the patient into the medical consultation as an active participant (6).

1. **The model of activity–passivity:** fully paternalistic, analogical to the parent–infant relationship, where the physician is active, and the patient is passive. This model is based on the physician's dominance, since the patient is not given the right to partake in decision- making, thus he relies on the physician's medical treatment. This model does not involve an effective interaction between the patient and the physician (5).
2. **The model of guidance-co-operation:** used in non-severe medical situations. When the patient is sick, he might, out of worry, want to take care of himself. This prepares him for cooperating with the physician. This act keeps the physician in a situation of power, where he directs the patient and expects compliance to his instructions. This model is analogically similar to the relationship between a parent and his adolescent child (5).
3. **The model of mutual participation:** describes a relationship set between equals and built on helpfulness. The interaction between the patient and the physician should be set at equal strength, freedom and gratification. This allows the patient to pay attention to his health, especially in the case of chronic diseases, where his awareness and understanding of his condition, and of the treatment he is undergoing, are essential to success. Therefore, the physician's gratification results from the help he offers to the patient, rather than from his dominance over the patient (5, 7).

Before and during much of the 20th century, the relationship between physician and patient was typically patriarchal (4). The doctor usually played a dominant role in clinical encounters and patients complied with the doctor's decisions, although sometimes suppressing their own inclinations. Society acknowledged that physicians had exclusive access to medical knowledge and special experience with health-related values and were thus in the best position to make medical decisions on behalf of the patient (4).

The types of relationships between physicians and patients over the past 30 years were described by Emanuel in 1992 (8) who attempted to synthesize such relationship by developing 4 possible models. These four models of the physician-patient interaction were elaborated by considering the different understandings of i) the goals of the physician-patient interaction, ii) the physician's obligations, iii) the role of patient values, and iv) the conception of patient autonomy. These models are called paternalistic, informative, interpretive and deliberative.

When compared with the previously described models (5), the models proposed by Emanuel additionally consider patients' care-related values and different degrees of autonomy (7), which cannot be disregarded as the conception of the physician's role and the importance of implementing a patient-centred approach have been questioned over the years (6).

The *paternalistic* model describes the traditional approach in which the patient has poorly formed values regarding the medical situation. The physician independently decides the interventions to be taken, providing the patient with minimal medical information. Indisputably, there are important medical scenarios where paternalistic care is still necessary, especially in the setting of acute or trauma care where immediate treatment must be rendered and, barring non-resuscitation orders, there is little room for negotiation. Representing a degree of increased patient involvement is the *deliberative* scenario. The patient in this scenario has minimally formed values, but the physician works with the patient to discover and develop these values. The physician acts as a teacher or a friend and he carefully presents selected medical information to the patient.

Decision-making is a shared effort, but the physician encourages specific recommendations based on an interpretation of established health-related values.

Continuing in the direction of greater patient involvement is the *interpretive* scenario, in which the patient has inchoate values regarding the situation which the physician helps to elucidate. Substantial dialogue regarding the condition and interventions is exchanged between physician and patient. Once presented with the pertinent information, the patient makes the decision, with the physician acting mainly as a counsellor.

Lastly is the *informative* scenario, where patient autonomy is high, and the patient has well-formed values; the patient alone takes on decision-making responsibilities. The physician's role serves a conduit of all relevant medical information (4).

Although making physician-patient interactions fit into predetermined patterns is very difficult, since no actual physician–patient relationship is perfectly identical to the theorized form of the model that it represents, the preferred model should be the deliberative one. This model encourages the patient's independence in making decisions, which occurs after the physician's helpful advice (4) and it promotes the three bioethical principles of autonomy, beneficence and non-maleficence (the obligation not to harm). The deliberative model incarnates the concept of autonomy, which is not only about making decisions independently and according to one's values, but also about choosing one's values independently. It enables the two□way flow of communication between patient and physician as treatments and values are discussed in a caring manner. It promotes shared decision-making allowing the physician to listen to the desires and values of the patient and for the patient to understand the knowledge that a physician offers in a manner that also satisfies the need for autonomy in the patient. This is because the patient feels that they can choose against the recommendation of the physician without quality of care being impacted (9).

Current views on the topic of physician-patient relationship models consider new aspects that are changing the classic models formerly described by Emanuel (8). Nowadays, the diversity of populations worldwide, as well as the continuous development in

medicine, are highly affecting the physician–patient interaction and they are striving for a new interaction that fits modern medical practice (7).

More recently, as new technologies have developed and access to the Internet and medical-based web sites has become increasingly widespread, models of physician-patient relationships have started to face changes in their definition.

In previous models, the impact of patient medical knowledge was not formally incorporated. The flow of medical information was assumed to move only from physician to patient, but with medical information becoming increasingly available to patients, such an assumption is no longer reasonable (4).

Additional alternatives to classic models of physician-patient relationships have been addressed lately, still relying on the core models previously covered (5,8) but with new focus on patient values and needs that have to be satisfied such as personal and familial, psychological and social, material and spiritual (7) and also considering his or her medical background due in part to the now widespread access to search engines.

In the study of Agarwal (4), also taken up by Aoun (7), a new dimension is introduced for consideration in the classification of relationship that occurs between physician and patient. This new added dimension is represented by patient medical knowledge that joins patient values and patient autonomy as the central variables considered in the definition of a new model.

A further perspective, supported by Clarke (10), claims that in clinical practice each patient has different needs and therefore it is challenging to fit the relationship between doctor and patient into one of the basic models investigated. In particular, the study discusses how models of medical decision-making have treated the patient alone outside of his or her social context without accounting for the patients' willingness and need to engage with their family members or other relevant figures in their lives. The final thought, therefore, is to overcome the categorization into models of the PPR and give a new value to the concept of patient autonomy by revising the communication process and support the patient involvement.

The role of Artificial Intelligence

In healthcare, the rapid proliferation of health information on the Internet has resulted in more patients turning to the Internet as their first source of health information and acquiring knowledge on their health conditions before seeking a professional diagnosis (11).

Along with the introduction of artificial intelligence (AI) that supports clinical practice and consequently the figure of the physician and the increased patients' authority over matters concerning personal values and preferences, we are witnessing the formation of new types of relationships between these two actors.

Artificial intelligence (AI) is defined as "computing technologies that resemble processes associated with human intelligence, such as reasoning, learning and adaptation, sensory understanding, and interaction" (12). The purpose of AI is to assist the physician in deciding on a diagnosis and on the best therapy for the patient, supporting diverse medical functions. Healthcare AI technologies are proposed for, either now or in the near-future: diagnosis of patients; performance of simple surgeries; well-defined tasks within more complex procedures; monitoring of patients' health and mental wellness in short- and long-term care facilities; basic physical interventions to improve patient independence during physical or mental impairment (e.g., physical aid, or reminders to take medications); independent patient mobility (e.g., voice command wheelchairs); and even particular tasks requiring physical interventions in dynamic contexts (e.g., blood draws) (13,14).

Home and social care are similarly transformed through the introduction of remote monitoring and management systems. Health can increasingly be monitored, modelled, and managed based on data representations of the patient, supplementing or replacing verbal accounts and face-to-face physical care (15, 16). The utility of AI in making medical predictions, such as making a diagnosis or estimating readmission rates in a health care setting, is also being studied. These AI capabilities will augment physicians' skills as well as reduce time spent on repetitive tasks making more affordable to concentrate on interactions with patients (17).

The sudden introduction, the complexity, and the continuous development and improvement of these technologies could affect the pre-existing and well-established relationship models between physician and patient, such as in terms of the weakening of the physician's role in his competences and in terms of the responsibility of the choices made in the diagnostic and therapeutic field.

Results

The impact of Artificial Intelligence on Emanuel's physician-patient relationship models

The underlying idea and expectation behind the introduction of Artificial Intelligence in clinical practice is to assist physicians to concentrate more fully on patients' engagement and helping them navigate their health options for treatment. AI may allow clinicians to be more attentive to patients and listen to their concerns instead of attending to documentation on the electronic medical record (17).

However, this may not necessarily happen in everyday clinical practice, which is why several scenarios may occur that could potentially affect the physician-patient relationship resulting in new concerns, including ethical considerations, that need to be properly addressed and solved.

Paternalistic model

In the paternalistic model, the patient is not actually aware of the important details of his medical situation, so the physician directly decides on the treatment that should be initiated, after briefly informing the patient about his case. The physician identifies the disease according to his diagnosis and then selects the treatment based on his medical knowledge and expertise.

A scenario that may occur by introducing AI into daily clinical practice is the capacity to help physicians in studying and analysing new therapeutic alternatives, enabling them to give far more precise recommendations, commanding greater respect from the patient on the basis of strong scientific power.

In this case, the patient may feel compelled to address greater respect and trust in the doctor, who has the support given by AI, reinforcing his role as a healer and deciding to rely completely on the therapeutic treatment proposed by him. In this case, we would see some sort of neo-paternalism that could be called *digital paternalism* in the doctor-patient relationship (18).

Remaining within the paternalistic physician-patient relationship model, the opposite of that described above may occur instead.

In fact, AI's efficiency in being able to identify the best diagnosis and therapeutic choice for the specific patient, also given the increasingly rapid development of precision medicine, may even disempower the physician's role, making this figure obsolete, as AI's medical knowledge will definitely be more powerful (3, 17).

Patients with low health-related values and absent or low autonomy and medical knowledge might even contemplate by-passing the figure of the physician and rely completely on AI for choice and adherence to the treatment plan. This new scenario could be referred to as Artificial Intelligence paternalism (19).

Informative model

As for the informative model, the physician explains to the patient all the different aspects of the disease, and then he recommends several treatments by pointing out the risks and benefits of each, based on his expertise and the medical information available. The patient here understands the physician's explanations, and after further clarifications, he is given the freedom to choose the intervention he deems best for him. In other words, in the informative model, the physician helps the patient by supplying him with the adequate medical information, and the patient has the freedom to decide upon the treatment he sees fit, since he already has sufficient medical knowledge regarding his condition. In this scenario, 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 informative 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.

Moreover, AI could also increase the interpersonal demands of patient care by giving a spectrum of treatment options to consider for a given disease, along with a wealth of information regarding prognosis and adverse effects. Doctors and patients could experience a decision paralysis: decisions could be delayed when AIs' recommendations are difficult to understand or to explain to patients and it may affect the organizational aspects of healthcare contexts (20).

Additionally, many patients might experience an initial distrust of AI, especially since the "black-box" nature of some technologies will make it impossible for the clinician to explain how many recommendations are generated by the algorithm (21).

A positive impact of AI on the physician-patient relationship in the information model can occur if the patient has medium-high levels of medical knowledge as he would be able to understand all the possible solutions generated by AI and displayed for him by the physician. In this case, the patient still makes the final decision himself but knowing that he has explored various possibilities and therefore feels even more confident in his choice.

Interpretive model

As stated before, incorporating AI into medical care will enhance the patient-clinician relationship by off-loading tedious work, thus allowing clinicians to spend more time directly engaging with their patients.

In this regard Ai acquires a positive connotation in the case of interpretive and deliberative physician-patient relationship models.

In the interpretive model, the physician acts as a counsellor because he provides medical information and tries to identify the patient's values and then decides upon the intervention that best fits with them. Thus, the physician must visualize the patient's entire life as a story in order to clarify the patient's values. Consequently, the physician proposes the intervention without forcing the patient to choose one treatment over another. It is up to the patient to decide which treatment best suits his values.

Here, AI might provide richer and more specific information about an individual patient's treatment options and expected outcomes. The various treatment choices are then introduced to the patient, and AI's presence helps in choosing the best therapy as it acts as a support to the physician in recommending the best possible therapy taking into account the patient's values and autonomy. Moreover, the time saved through AI could allow clinicians to engage patients more meaningfully in shared decision making, delving into the patient's moral issues or values that are wanted to be explored and strengthening the PPR.

Deliberative model

Finally, considering a close examination of the interpretive model and patient involvement, it is safe to say that AI could positively influence the relationship described by this model. The physician's role in the deliberative model is not only to propose interventions that the patient could undergo, but also to teach him about the medical therapy he should adopt, thus acting as a friend and a teacher. The concept of autonomy in this model promotes moral self-development, since the patient's role is not only to follow certain rules, but also to suggest health-related practices and value their importance regarding the intervention (7).

The physician communicates with the patient in order to identify the patient's core values and elaborate upon them. The discussion between the patient and the physician is professional, which means that the conversation is only about health-related issues and values related to the medical case. The physician here only provides his opinion on the intervention he selected, without forcing the patient into accepting it.

The patient feels confident in knowing that the option recommended by the physician, and which he may decide not to follow based on his health-related and moral values that are respected and highlighted, is supported by careful AI-provided research and study. This allows for more thorough and complete discussions, without letting potential therapies go unexamined, as in this model the physician follows scientific evidence supported by AI.

Conclusion

The physician-patient relationship models introduced by Emanuel (8) have served as the foundation for understanding the dynamic nature of the physician-patient interaction for more than 30 years.

Since society and medicine has changed nowadays, young physicians are finding difficulties in applying the old PPR patterns to the current medical situation (4).

Some approaches described, such as the paternalistic one, no longer meets the expectations of today's societal context in which the doctor-patient encounter takes place.

Nowadays there are additional aspects to be considered when describing the figure of the patient and the physician.

The patient indeed now approaches the physician with a greater awareness of his own moral values and needs that he expects to be respected and accounted for when choosing the best treatment, in addition to the fact that he often has a strong knowledge in the medical field.

The physician, on the other hand, is expected to be respectful of what the patient considers to be valuable in his clinical and sociocultural sphere, and in addition to needing to improve this relational aspect, he is also required to use, collaborate with, and interpret the outputs presented by AI and condense it all so that it is properly displayed to the patient.

Therefore, it is difficult both on the patient's and the physician's side to fit in Emanuel's models, which do not consider these new aspects and consequently the new dynamics that may be forming between them. Therefore, it appears worthful to revise these models by incorporating the impact AI has on physician-patient interactions because it is an established reality that is difficult to ignore.

If the Deliberative model seems most appropriate (8, 9), then is crucial the need to implement changes in medical care and education to encourage a more caring approach, educating physicians not just to spend more time in patient communication but to elucidate and articulate the values underlying their medical care decisions, including routine ones.

Future physicians will need a broad range of skills to adequately use AI in clinical practice, including knowledge of mathematical concepts, AI fundamentals, data science, and corresponding ethical and legal issues (22). These skills will help them to use data from a broad range of sources, supervise AI tools, and recognize cases where algorithms might not be as accurate as expected, so that the best therapeutic path can be embarked on together with the patient. Furthermore, communication and leadership skills as well as emotional intelligence will be more important than ever as AI-based systems will not be able to consider all the physical and emotional states of the patient (22).

There is a need to further explore and reconsider the training and education of physicians in the area of their communication skills, including the aspects of compassion and empathy that are independent of the education and skills acquired during their training years.

Keeping patients at the center of the mission, doctors-in-training could learn how to manage patient data by exploring the impact of multiple influences on patient health, such as social determinants, clinical diagnosis and care, timely decisions, and teamwork with other health professionals (23).

Communication skills are not an innate talent of the doctor, and they can be improved over time by trying to practice these communication and relationship building abilities, in particular through regular feedback on the acquired behavior, or by increasing the attention in recognizing a difficulty in the patient's self-expression, perhaps due to a psychological background and concerns of difficult understanding (3).

Policy and regulation can potentially play powerful roles to ensure the development and consolidation of PPR, even as AI systems are introduced into the healthcare ecosystem (13).

Physicians using AI systems must be able to interpret and filter AI-derived outcomes in order to tailor patient-oriented solutions. This may be accomplished through a validated educational training approved by guidelines shared among various national and international bodies.

Surveying patient populations in relation to autonomy, values, and medical knowledge will help identify the most common typologies of patients. This will enable physicians to recognize more quickly the types of patients and understand more clearly the clinical approaches that are most needed (4).

Moreover, another complementary solution with the aforementioned one involves patient engagement. In fact, also patients (and/or caregivers) need to understand what AI is and how it is relevant to daily clinical practice, what benefits it can bring and how it could affect the relationship with their physician. This solution can be achieved through an educated consent (24) of the patient or caregiver, that would involve patients in a conversation about these protocols and procedures and requires more active forms of consent.

Physicians and patients often make trade-offs when deciding on treatments; one example is between quality of life and length of life. As a result, there is no such thing as a one-size fits-all approach to patient treatment (23).

Shared decision-making entails both communicating the benefits and risks of treatment options based on clinical protocols and the best available evidence and eliciting what is most relevant for patients and their families. It is necessary to implement a gradual process, respect for individual sensitivities, and an authentic ability to listen to the perspectives of others (25).

It is important for AI systems to capture the complexity of multiple-choice scenarios, and when a medical decision necessitates a trade-off, it must still be delegated to the stakeholders (23).

Despite the development and the increasing use of AI in clinical practice, it is necessary to continue to maintain the centrality of the relationship between doctor and patient, in order to not lose sight of the goal of the clinician, which is the health and care of the patient.

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