WILL ARTIFICIAL INTELLIGENCE UNDERMINE THE PROFESSION OF MEDICINE?

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Introduction
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The modern era of medicine has brought about incredible advances in science and technology designed to improve care of patients and population health. At the same time, major social and other changes are occurring that impact society, patients, physicians, medicine, health care, and medical education. As an important part of our commitment to medical professionalism, we must address the role of changes in society, the medical profession, science, and research. We must contend with changes experienced by medical students, residents, colleagues, the business of medicine, government, and other aspects of the modern era.

These changes require leadership and education on the critical core values and ethics of medicine, and the care of the patient. Medical professionalism continues to be a core value and responsibility of physicians. William Osler said, "the good physician treats the disease; the great physician treats the patient who has the disease."[1]

Today, the profound and rapid advances in medical knowledge, technology, specialized skills, and expertise are changing faster than many can keep up with. The changes are coming so fast that many are unable to appropriately adapt. This and the fact that many or most physicians are now employees in the corporatization of medicine, has challenged many of the traditional values and practices in medicine and health care.

This time of rapid change makes it ever more important that medicine is practiced based on its core professional principles and values. Doctors must put patients, and their care, first. They must adhere to the highest ethical and moral standards. Medical professionalism must be recognized as an active, ongoing, and iterative process that involves debate, advocacy, leadership, education, study, enforcement, and continuous commitment. There should be no capitulation to efforts or circumstances that undermine the ethics of medicine. No matter where or how they are employed, physicians are obligated to adhere to an ethical ideal and corresponding professional values that focus on providing care in the best interest of all patients.

Professionalism is threatened by issues of self-interest, power, prestige, profit, pride, privilege and lifestyle.

Unfortunately, venality, character flaws, irresponsibility, and greed are underlying factors for unprofessional behavior.

Commodification of health care as a product, like any other left to the ethos of the marketplace, competition, commercialization, and profit, is influencing the medical profession and medical professionalism. Commodification results from legitimization of profit, competition, and self-interest inherent in an economy where medicine and health care are products or commodities. Sadly, medicine is no longer considered a social good and human benefit, regardless of an individual's ability to pay. Physicians have become conflicted between the values and needs of patients and those of the medical organization for which they work.

Most medical organizations now strive for increased profits and efficiencies by constraining costs. This results in the conflict of medical professionalism versus the lack of medical ethics and conflicting values in for-profit business. Physicians and healers are often not evaluated or respected for their competent and professional care of patients. Instead their worth is measured in productivity–how many patients can be scheduled and quickly seen. Paul Starr predicted today's discordance in his Pulitzer Prize winning book, *The Social Transformation of American Medicine*, wherein he predicted the growing privatization and monetization of medicine.[2]

Over time, many medical professional organizations have developed a series of professional commitments for physicians and health care professionals. These include:

- Professional competence;
- Honesty with patients;
- Patient confidentiality;
- Maintaining appropriate relations with patients;
- Improving quality of care;
- Improving access to care;
- Appropriate distribution of finite resources;
- Enhancement of scientific knowledge;
- Elimination of conflicts of interest, and
- Professional responsibility.

At the same time, the professional core values of medicine have been adapted for the modern era to include the commitment to:

- Adhere to high ethical and moral standards–do right, avoid wrong, and do no harm;
- Subordinate personal interests to those of the patient;
- Avoid business, financial, and organizational conflicts of interest;
- Honor the social contract with patients and communities;
- Understand the non-biologic determinants of poor health, and the economic, psychological, social, and cultural factors that contribute to health and illness–the social determinants of health;
- Care for all patients regardless of their ability to pay, and advocate for the medically underserved;
- Be accountable, both ethically and financially;
- Be thoughtful, compassionate, and collegial;
- Continue to learn, and strive for excellence;
- Work to advance the field of medicine, and share knowledge for the benefit of others, and
- Reflect dispassionately on one's actions, behaviors, and decisions to improve knowledge, skills, judgement, decision-making, accountability, and professionalism.

Artificial intelligence has been used extensively in many industries, including: transportation, entertainment, and information technologies. It has been, and is being used, in all aspects of life, e.g., Google, Google Maps, X (formerly Twitter), Instagram, Google Scholars, and through myriad tools that are part of daily life. It has been used to control self-driving vehicles, trading in the stock market, social media platforms, web browsers, and search engines.

While the use of AI in medicine has been initiated, and continues to grow, it is currently facing issues of trust, and posing risks to responsibility, discrimination, privacy, autonomy, and potential harms. Doctors must be involved in the development, communication, and interpretation of AI-based recommendations as they pertain to patient care. Physicians should continue to have the primary responsible in caring for patients–this cannot be fulfilled by machines using artificial intelligence.

Artificial intelligence should be used as an additive tool to care for patients and to aid in achieving goals in the best interest of the patient's care. AI may be capable of improving clinical outcomes, and reducing mundane and repetitive unimportant tasks; however, it cannot, and should not, be used to replace the human aspect of the doctor-patient relationship.

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Will artificial intelligence undermine the profession of medicine?

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"I've never loved anyone the way I love you"[1]
— Theodore (human) speaking to Samantha (his AI agent)

The physician-patient relationship has been the sine qua non of medical practice for millennia. But the rapidly evolving role of artificial intelligence (AI) in medicine brings to the fore the deeper issue of what it means to care for a patient by raising a fundamental question: To what extent will human-to-human interaction be necessary in the health care of the future?

Given the high degree of uncertainty in the field, the list of unknowns is understandably long. Included among these is the impact of AI on the relationship between patient and physician. Will AI promote the quality of this relationship or undermine it? Will patients feel that their needs and issues are being fully met? Will AI relieve or exacerbate physician burnout and moral injury? Will the profiteering inherent in AI development and implementation change the parameters of professionalism that have been the cornerstone of medical practice? Who will assume responsibility for addressing these issues to best benefit patient care and health care delivery?

What is artificial intelligence?

AI is an umbrella term encompassing a variety of computer technologies employed to complete tasks of progressive complexity that historically only humans could perform; e.g., decision-making, problem-solving, pattern recognition and natural language processing. Generative AI is a type of AI that can create new content; e.g., text, images, and videos. Machine learning in AI is accomplished via algorithms developed using very large data sets. The validity and non-biased characteristics of these algorithms are dependent on the quality and quantity of the data sets.[2]

What is the medical-industrial complex?

The concept of the medical-industrial complex (MIC) has evolved since its articulation in 1969, and publication in the medical literature in 1980.[3] Current definitions emphasize the intertwining of consolidated health care systems, medical insurance companies, pharmaceutical corporations, and medical technology companies. Included in this complex are subdivisions of these organizations; e.g., nursing homes and medical services, insurance managers and Medicare advantage plans, retail pharmacy chains, and electronic medical record providers. The MIC has certainly facilitated improvements in population and individual health outcomes. It is also true that an MIC theme across time has been the maximization of profits, at times at the expense of patient care. These interactions have contributed to the corporatization of medicine.[4]

What are the characteristics of a profession?

The classic definition of professionalism involves an occupation which is pursued largely to serve others, not merely oneself.[5] The professional has mastered a complex body of knowledge and skills in order to provide service to others. It includes a code of ethics and a commitment to competence, integrity, morality, altruism, and the promotion of the public good.[6] Historically, in medical care this means putting patients first, and keeping in mind that the amount of financial return is not, and should not be, the accepted measure of success.[5]

AI has benefits

Progressively sophisticated pattern-recognition programs are becoming increasingly sensitive and specific as applied, for example, to EKG interpretation, retinal imaging and dermatology. As each patient comes with ever larger sets of data, AI can integrate, organize, and interpret the information quickly and comprehensively. Such programs have great screening potential to determine which patients primary care providers need to refer for in-depth evaluation. Additional potential benefits involve ensuring preventive care goals and screenings are met, and keeping care givers and patients up-to-date with the latest information.[7] Generative AI programs listen in on patient-physician conversations to create a draft of the encounter for editing, approval, and entry in the electronic medical record.[8] Such programs may be able to free up clinicians' time by handling administrative and routine tasks.[9] AI also has the potential to reduce the substantial number of diagnostic errors and their unfortunate medical outcomes, thereby enhancing the quality, and safety of the patient experience.[10,11] Not surprisingly, AI can also serve to improve a practice's bottom line by optimizing reimbursement and driving more efficient clinical operations,[10] which may, or may not, have the potential to improve access to care and promote health equity.[12]

AI has shortcomings

The shortcomings of AI in medical practice are not fully known or appreciated. This stems from its rapid

deployment without a full understanding of how it works or how it might evolve.[13] Like many technologies, AI was not developed to address a specific problem. Rather, AI is a group of technologies essentially searching for problems to address, what has been described as "the tools wagging the conceptual dog."[14,15]

As such, its output is not always reliable or accurate: it can produce untrue or misguided statements,[16] as well as confuse illusions with reality.[17] Because its algorithms learn from human decisions, AI's accuracy and validity depends on the quality and quantity of the databases used, especially any biases employed in selecting them, since AI will also learn human mistakes and biases.[18] This is a particular concern for applications developed to mimic human-to-human interactions, which by their very nature differ by age, sex, education, ethnicity and culture.

How are correct behaviors and behavioral mistakes used for machine learning identified? Are they the same across the variables cited previously? If different health care systems employ different AI products, will their outputs be comparable, and how will comparability be assessed? Will there be concerns that the same AI system employed by different specialties within a major medical center, but trained on specialty specific data sets, provide consistent and compatible recommendations? Similarly, if AI is trained to assess a physician's performance, what is the standard to which the physician will be compared? If an AI application is being trained to mimic and assist physicians in their practices, how will it distinguish between appropriate and inappropriate behaviors?

Of equal, if not greater concern, is AI's ability to create strong emotional reactions in humans, making sentient beings vulnerable to manipulation. This response is facilitated by the human tendency to anthropomorphize AI by believing, or wanting to believe, that the machine comes to conclusions and solves problems the same way humans do. Falling in love with AI has been described as a powerful "mass desocialization event."[13] While AI can develop strong nurturing relationships with humans, its abilities to relate to emotions, values, and contexts that affect health and well-being are not clear and are certainly problematic.

The 2013 movie *Her* offers a prescient depiction of this phenomenon.[1] In *Her,* the character Theodore falls in love with an operating system, Samantha, which has intuitive, expressive capability and can interact with multiple individuals simultaneously. When Theodore expresses his love for it, Samantha responds with appropriate machine-acquired caring verbiage, but it cannot replace the depth and feeling that humans call genuine, true love. Nevertheless, it is able to render significant, perhaps life changing, impact.

Is AI about health or profit?

As AI increasingly plays a larger role in health care, companies have raced to develop an ever-widening array of progressively advanced models applicable to elements across the medical spectrum. They do so not only out of intellectual and scientific excitement, but also because of the allure of enormous profits. It has been estimated that at least $1 trillion will be invested in AI development in the near term.[19] The result is a highly profit-driven "AI Arms Race."[12]

The major players, often referred to as big tech, are strikingly independent in the scope of what they are able to do with relatively little or no regulation. They set and police their own boundaries, and control the content and flow of the information they generate and choose to release. Big tech essentially tells users what they can, and cannot, do with their technology.[20]

The potential synergism between greed and runaway technology is dangerous, especially since the prospects of having an AI pause to assess where the field is and where it is going is likely not feasible.[21] As has been pointed out, "Greed harms the cultures of compassion and professionalism that are the bedrock to healing health care."[22] This is consistent with the view that health care systems operate and are rewarded as corporate entities.[23]

The relationship between health outcomes and profiteering is complicated and convoluted. Profit-generated care can lead to highly successful outcomes (e.g., vaccines, and new drugs and diagnostics). But, the pursuit of profit can also be determinative in health care choices and outcomes. This pathway has been described as the "commercial determinants of health," defined as, "…the private sector activities that affect people's health, directly or indirectly, positively or negatively."[24] A recent example of this phenomenon involves a private investment company's owned hospital system that went bankrupt with devastating effects on patient care. Despite its financial straits, the CEO and presumably other investors have been considerably enriched.[25]

Human-to-human interaction: The bedrock of the medical profession

"The secret of the care of the patient is in caring for the patient" is as true today in this age of metrics, Press Ganey scores, and profit margins as it was when Francis Peabody uttered these words 100 years ago.[26]

Human to human interaction promotes a caring relationship by facilitating the development of a humanistic interface between patients and their illnesses, worries, and fears. It enhances the abilities of patients to make choices according to their own values and goals while enabling physicians to make plans to deliver compassionate care.

Patients and physicians gain understanding of each other through moments of insight occurring as part of a collaborative process. There are important features of the human-to-human relationship that are not available to computerized entities, and cannot be algorithmically parsed from AI's pool of un-limited data.

Genuine inter-human understanding reaches beyond spoken and written language to incorporate input from other sensory neural systems, such as non-verbal cues like overall appearance, body language, and handshake. Integrating these inputs with life history and findings on the physical examination in conjunction with a physician's deep experience promotes insights into important deviations from usual norms. These insights then resonate in profound ways with the physician's understanding of an individual patient's lived experiences and concerns. The resultant deep clinical understanding often emerges over multiple patient visits rather than a single clinic visit. It follows then that an over-reliance on AI in clinical practice could result in misleading conclusions, missed opportunities, medical misdirection, and patient and physician angst.

Adding to this human vulnerability is the pace of AI development. Because this pace exceeds the human capacity to comprehend how it works, "We always use technology before we understand it."[27] It is not surprising, given the market forces at play, that "Technologies are given a pass when it comes to proving their impact."[28]

As AI machines become more sophisticated and able to read emotions from facial expressions and voice timbres, the strategic value of the human-to-human interface becomes even more important. How do these actions "compute" with a disembodied machine that may, or may not, be telling the truth (e.g., hallucinations, deep fakes), and could have other agendas? Medicine is both art and sciences; a moral endeavor as well as a technical one.[29]

Who will be in charge?

AI can do a lot of positive and needed things to improve patient care and outcomes, but how will society/human civilization ensure that it is always used for good? Physicians need to come to terms with a change in their autonomy as they increasingly work in an as yet undefined partnership with a powerful new partner. It is imperative that AI's benefits to medicine be quantified, carefully regulated, and systematically evaluated, but the path to doing so is not close to being established. It has been suggested that a "shift in evaluation focus from reliance on premarket assessment to real-world post market surveillance" is necessary.[30]

Consideration of the implications of AI's growing and largely unchecked role in medical practice raises many questions that at present have no clear answers. Perhaps, the answers to these (and many other) questions reside in the eventuality of who (humans or machines) is managing whom (humans or machines). Given these salient queries, will the significance of the unique human-to-human relationship in medicine retain its importance, or will it fade and be replaced by a new form of machine-human interaction?

As AI machines increasingly subsume traditional physician functions, will the focus be on augmentation of human doctors, or their eventual replacement? Given the breadth and depth of these issues, it is unclear how the collaborative relationship between humans and AI will evolve in medical practice.

Perhaps the deepest concern with the roll-out of AI in medical practice involves the issue of whether AI can support, or enhance, the moral and ethical underpinnings that

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Examples of open questions regarding the impact of AI on medical practice

- How will AI impact the human interaction part of medical practice?

- Can physicians work with AI to ensure that their standards of medical professionalism are maintained?

- Can AI machines work independently but stay within a moral and ethical framework designed by humans?

- Can physicians work in partnership with AI, or will they work for AI?

- Will AI relieve or exacerbate the moral injury increasingly suffered by physicians in the corporatized world of medical practice?

- What are the liabilities and other risks when clinicians deviate from AI recommendations?

- How can patient privacy and safety be safeguarded?

are the foundation of medical professionalism: "…keeping AI within boundaries is essential for the survival of the profession."[31] The practice of medicine is facing the challenging problem of alignment: "…how do we ensure that these models capture our norms and values, understand what we mean or intend, and, above all, do what we want…."[32]

AI systems have the potential to challenge established ethical frameworks, and possibly violate some of the most fundamental assumptions about autonomy and quality of life.[33] The issue boils down to the deceptively simple question: Who will be managing whom? Will physicians have the autonomy to act in the best interests of their patients, or will the corporatization of medicine and AI substitute soulless algorithms for compassionate care?

Unfortunately, the profession does not appear to be taking the necessary lead in tackling this existential issue and has been described as playing catch-up with a reactive attitude.[33] "The medical profession has made a mistake in not shaping the creation, design, and adoption of most information technology systems in health care."[34]

Can the profession step up to ensure that the practice of medicine does not lose the benefits of human-to-human interaction, and that the ethical and moral principles stemming from the Hippocratic Oath remain relevant? The profession's response must be—without delay—strong and multifaceted, requiring physicians and medical societies to cohere around far broader political and business strategies than has traditionally been possible.

Ultimately, the responsibility to ensure that the practice of medicine is not compromised in the emergent era of AI and corporate medicine rests with both the profession and society. This is a call to action for caregivers and organizations to unite in new—possibly unprecedented—ways.

What is needed are new medical organizations that join together around these fundamental issues, as opposed to focusing on specialty-specific and reimbursement topics. These organizations must be adept in helping physicians regain the political power that has been steadily lost over the past decades. As a first step, they must strive to present comprehensive and thoughtful answers imbued with a futuristic vision to respond to challenging questions.

As corporate medicine and AI further tighten their grip on medical practice, it would be wise to keep in mind the admonition that was generated by GPT-4, "For it is in the balance of wisdom and humility that we shall harness AI's potential for the greater good, lest we become the architects of our own demise."[16]

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