Generative AI as Third Agent: LLMs and the Transformation of the Clinician-Patient Relationship

Hugo Campos Jr, Daniel Wolfe, Hongzhou Luan, Ida Sim

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Hugo Campos Jr[1*]; Daniel Wolfe[2*] MPH, MPhil; Hongzhou Luan[2*] MEng; Ida Sim[2, 3*] MD, PhD

[1]Strategic Advisory Board Computational Precision Health, UCSF and UC Berkeley Oakland US
[2]Computational Precision Health, UCSF and UC Berkeley Berkeley US
[3]Division of Medicine University of California San Francisco San Francisco US
[*]these authors contributed equally

Corresponding Author:
Hugo Campos Jr
Strategic Advisory Board
Computational Precision Health, UCSF and UC Berkeley
4728 Allendale Ave.
Oakland
US

Abstract

Use of generative artificial intelligence (AI) in healthcare presents a complex and evolving landscape with significant implications for patient-clinician interactions. Recognizing the new practical and ethical challenges raised by what may be referred to as “relational AI”–large language models (LLMs) able to “relate” to clinicians, patients and caretakers by generating human language–this paper examines the potential of generative AI to serve as a facilitator, interruptor, or both in patient-clinician relationships. Drawing on work as advocates of patient empowerment, students of computer science, and physician informaticists working to increase capacity for data exchange and mobile health, we recognize the potential for generative AI to enhance patient engagement, triage care, and support clinical decision-making. These same perspectives give us concern surrounding generative AI use and data privacy, algorithmic bias, moral injury, and the preservation of human connection. Considering the transformative power of LLMs on patient-clinician dynamics–and the still open questions about which direction that transformation will take–this paper outlines an analytic framework to understand the role and implications of generative AI in the patient-clinician relationship, and proposes an agenda for future research. Maximizing the positive potential of generative AI will require a thorough examination of which aspects of the patient-clinician relationship must remain human–and why–even if LLMs could provide a substitute. This inquiry will need to draw on ethics and philosophy to complement more traditional informatics imperatives such as patient-centered design, transparency on the use and limits of AI models, and collaboration between technologists, healthcare providers, and patient communities to shape the responsible integration of relational AI into clinical care.

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VIEWPOINT:
Generative AI as Third Agent: LLMs and the Transformation of the Clinician-Patient Relationship

Keywords: Artificial Intelligence; Large Language Model; Generative AI; Healthcare; Empowerment; Patient-clinician relationship; Patient engagement

Abbreviations:
AI Artificial Intelligence
EHRs Electronic Health Records
LLMs Large Language Models

Abstract

Use of generative artificial intelligence (AI) in healthcare presents a complex and evolving landscape with significant implications for patient-clinician interactions. Recognizing the new practical and ethical challenges raised by what may be referred to as "relational AI"–large language models (LLMs) able to "relate" to clinicians, patients and caretakers by generating human language–this paper examines the potential of generative AI to serve as a facilitator, interruptor, or both in patient-clinician relationships. Drawing on work as advocates of patient empowerment, students of computer science, and physician informaticists working to increase capacity for data exchange and mobile health, we recognize the potential for generative AI to enhance patient engagement, triage care, and support clinical decision-making. These same perspectives give us concern surrounding generative AI use and data privacy, algorithmic bias, moral injury, and the preservation of human connection. Considering the transformative power of LLMs on patient-clinician dynamics–and the still open questions about which direction that transformation will take–this paper outlines an analytic framework to understand the role and implications of generative AI in the patient-clinician relationship, and proposes an agenda for future research. Maximizing the positive potential of generative AI will require a thorough examination of which aspects of the patient-clinician relationship must remain human–and why–even if LLMs could provide a substitute. This inquiry will need to draw on ethics and philosophy to complement more traditional informatics imperatives such as patient-centered design, transparency on the use and limits of AI models, and collaboration between technologists, healthcare providers, and patient communities to shape the responsible integration of relational AI into clinical care.

1. Introduction

The integration of artificial intelligence (AI) into healthcare has rapidly transformed various aspects of medical practice, from diagnostics to treatment planning. The emergence of generative AI, particularly large language models (LLMs) that can interact and communicate with humans in a personalized and empathetic way, heralds what some commentators have termed "relational AI" [1], with LLMs now functioning less like tools and more like "agents in the clinic," interposing themselves into patient-clinician interactions [2]. While the promise of generative AI in health is vast, it is crucial to address the apprehensions and concerns of both patients and clinicians to ensure that AI serves as a facilitator, rather than a divider, in their relationships. This paper explores patient and clinician perspectives on the clinical use of relational AI, examines the potential evolution of clinician-patient relations through a trilateral framework that considers AI both as facilitator and

interruptor, and proposes a research agenda for advancing participatory medicine in an AI-enabled clinical relationship.

Patients have long sought medical information and support outside of traditional clinical settings, and since the advent of the Internet, turn often to online resources, listservs, and virtual communities [3]. The emergence of powerful and easily navigated search engines, followed by Web 2.0's interactive and social platforms, amplified this trend, offering patients unprecedented access to medical knowledge, personalized recommendations, and peer-to-peer platforms for sharing personal medical information and clinical experiences [4]. The rise of Internet use for health information and self-diagnosis has both fueled a movement of e-patients [5] and raised concerns regarding the accuracy and reliability of the medical information patients find, as well as the impact of "Dr. Google" on patient-clinician relations. The ship has sailed: as many as half of Americans seek healthcare information online for themselves or others. Despite fears, this has not resulted in evidence of negative effects on health outcomes or the patient-clinician relationship. [3, 6, 7]

The expansion of the digital health marketplace, including smart watches, portable blood pressure cuffs, heart tracking devices, and other wearables that collect health data, along with apps that interpret them, have further increased potential for patient engagement in managing their health. More than one in three Americans now possess a wearable device gathering data on health or fitness [8]. The smartphone can serve both as a collector of health information and a critical channel for delivering digital therapeutics. Apps can track health metrics to motivate or discourage multiple behaviors with health impacts (eating, sleep, stress regulation and more). The smartphone as a health data repository has been aided by the passage of the 21st Century Cures Act requiring health systems to adopt information standards allowing data export and interoperability with other systems, and mandating that patients have electronic access to their health information at no cost [9]. Multiple observers, including advocates from the Open Notes movement–which promotes trust-building through the sharing of clinical notes between healthcare providers and patients–and designers of AI systems, have heralded these developments as key enablers of a shift to democratized, person-centric and participatory healthcare [10, 11]. To paraphrase the manifesto of e- (and other) patient movements: data is power [12].

The release of LLMs that allow patients or providers to generate plain language summaries of health information, and increasingly, to interact with LLMs by iteratively "prompting" them with individual health data, adds another layer to this intricate landscape. For patients, this development has the potential of revolutionizing empowerment and engagement with both healthcare and self-care. For healthcare systems and digital health companies, use of generative AI and LLM interfaces to respond to patient enquiries, summarize clinical history, or assist in differential diagnosis or predictions of health outcomes, is both transformative and inevitable. Recent commentators have noted that as the power of this technology increases, so does the need for vigilance and continued upskilling of health workers in the interaction between LLMs and the clinician or healthcare systems [13, 14].

Building on the framing of generative AI as a "relational" technology, this paper focuses on the impacts of LLMs on clinician-patient relations. The degree to which these impacts are evident or acknowledged during a clinical encounter, and whether or not LLMs are a facilitator of or impediment to therapeutic alliance, are open questions. Writing from our perspectives as patient advocates, computer scientists, and physician-informaticists, we explore various scenarios where AI plays a role in clinical exchanges. We propose a research agenda aimed at better understanding current attitudes toward and uses of LLMs, while moving us toward a collaborative use that enriches the therapeutic interpersonal connections at the heart of medicine through which health outcomes are most meaningfully improved.

2. Patient and personal care team: the rise of the AI patient

Patients regard AI use in healthcare with significant caution. Six in ten say they would be uncomfortable with their provider relying on AI in providing their care, and a nearly equal number think that using AI to diagnose disease or recommend treatment would make relations with clinicians worse [15]. On the ability of computational processes to work more fairly than humans–for example, in reducing racial bias–Americans are also divided. A majority believe racial bias would be decreased if AI were used more to do things like diagnose disease and recommend treatments for patients. Computer scientists and health policy analysts have documented encoded bias in AI algorithms, and warn that excitement for AI-driven medicine should be matched with clear-eyed assessment of the possibility of exacerbating existing risks and creating new points of vulnerability[15–17].

For a growing number of patient advocates, AI is also seen as a new actor and potential ally, particularly in addressing the gaps in access and communication that often plague the current healthcare system. LLMs and their chat interfaces–whether GPT, Llama, Gemini or others–can lower the tech and language literacy barrier for patients, allowing them to ask plain-language questions, in multiple languages, and synthesize complex, highly technical health-related literature in ways that are understandable at a range of educational levels. For multiple issues confronting patients, LLMs offer potential assistance or paths toward resolution within or independent of the healthcare system.

As a caretaker for his elderly father and a patient with a genetic heart condition, lead author Hugo Campos has relied on AI for various tasks, including preparing for appointments by organizing his health information, weighing the pros and cons of different medical interventions, and summarizing medical notes for a family member not fluent in English [18]. His recent leveraging of AI to navigate his father's complex medical needs demonstrated the technology's potential to empower informed patients and bridge information gaps (see sidebar). More generally, LLMs are already being used by patients, and the families and caregivers who are integral to their care, to simplify and improve understanding of informed consent forms, to parse complicated communications from insurance companies or a medical note, or to better understand lab notes, and to translate any and all of the above into different languages [19]. For Campos and others whose patient advocacy has been facilitated by the rise of the Internet, this has led to a new kind of e-patient: the AI patient. For these patients and their family members, LLM agents are new and important tools for "participatory medicine," which encourages, expects, and often requires active digital involvement by all parties as part of the care continuum [18, 20].

Begin sidebar: Hugo Campos faced a challenging situation when his elderly father developed a severe pruritic rash, and the earliest available dermatologist appointment was months away. Drawing from his experience using LLMs for his own healthcare, Campos turned to various publicly available chatbots, including Claude 3 Opus, Perplexity, and GPT-4o, for counsel on his father's condition. He meticulously collected his father's medical records by downloading clinical notes from past clinical encounters and accessing blood test results (with permission) through his father's electronic patient record portal. Under the terms of the 21st Century Cures Act, healthcare providers now face penalties if they fail to provide patients with access to all health information "without delay" and free of charge [21].

Armed with these records, including lab results, recent clinical notes, and photos of the rash, Campos then used multiple LLMs to analyze these inputs. The models provided differential diagnoses, recommended actions, and identified a potential link between the rash and his father's underlying chronic kidney disease.

Campos then developed a multi-pronged treatment plan based on AI recommendations. The plan included strict dietary adjustments to manage kidney function, reducing shower frequency and temperature to prevent skin dryness, aggressive moisturizing with fragrance-free products, and the application of both over-the-counter and prescription topical corticosteroids (Cortizone 10 and Triamcinolone) to control itching and inflammation. Campos also used AI to translate this information into Portuguese, ensuring his father could actively understand the proposed treatment plan and participate in the decision-making process.

By comparing outputs from different AI models and validating AI-suggested interventions through online searches and email correspondence with medical professionals, Campos implemented a care plan that significantly improved the rash within ten days. By the time they finally saw the dermatologist, the rash had mostly cleared up.

This case demonstrates AI's value as a resource for patient empowerment and insight generation. Strategic use of LLMs enabled a collaborative approach that transformed the traditional patient-clinician dynamic into a more equal partnership, ultimately leading to better outcomes and enhanced patient satisfaction.

Prompts and outputs from LLMs are included in Appendix 1.
End Sidebar

While all patients have the potential to increase their sense of agency and engagement in their healthcare, not all have the technological literacy to avail themselves of AI tools for participatory medicine. The potential is thus very real for AI to exacerbate existing health disparities and create a digital divide between those with the skills and resources to use AI tools effectively and those without. Former Google CEO Eric Schmidt, speaking to Stanford students at a 2024 forum on AI's likely impact on global development, offered a prognosis relevant here: "the rich get richer, and the poor do the best they can" [22]. For example, the size of the "context window" that determines the number of informational tokens that an LLM can take in is expected shortly to grow to more than a million tokens, or the equivalent of 750,000 words. This massive expansion, a 45-fold increase from earlier models such as GPT 3.5, will mean that those who can pay for premium LLM services will receive more personalized and contextualized answers; those relegated to smaller, freely available context windows will not. Even use of freely available tools will require understanding of multiple dimensions: in presentations, Campos underscores the importance of equipping patients with English proficiency, medical literacy, numeracy, and critical thinking skills to help them make informed decisions in an increasingly AI-mediated healthcare landscape [23].

While use of an LLM as an AI ally or "second opinion" offers great potential, the question of how or whether LLMs enter into the patient-clinician relation is more vexed. Just as the e-patient movement emphasized individual control over "my data" [12], many support using LLMs to empower individual patients but are wary of their use for institutional, health system, or commercial goals. Comfort about when or if AI is used in the diagnostic and care pathway may well vary by patient and condition: pre-LLM surveys of patients asked to consider AI use to augment or replace physician input, for example, found significant differences in concerns about privacy and AI-assisted diagnosis among those with chronic or acute conditions, as well as variation in understanding of AI function by age, and demographics [24]. AI models are frequently trained on data sets drawn from limited population samples, producing output based on past patterns of access and treatment that may reinforce racial or socioeconomic bias [16, 25].

Usage transparency–knowing when an AI is being used by any part of the healthcare system–is also likely to be key to patient trust. Patients will discern whether medical professionals or health systems deem them worthy of enough respect to disclose when AI has been deployed in their care and to inform them of potential limitations [26]. Rosie Bartel, a participant at a recent patient advocacy forum, shared a recent experience with a clinic representative named Jennifer. Rosie had been messaging about medication refills and scheduling an appointment and found Jennifer to be helpful, kind and friendly. They even chatted about personal topics. When Rosie arrived for her appointment, she asked to say hello to Jennifer, only to be told at the front desk that Jennifer was an AI assistant–not a real person (personal communication, 2024). While AI can augment patient support, many patients express discomfort when it is used to replace a genuine human connection. But is the discomfort arising from being misled? Or from deeper existential qualms about forming relationships with a non-human entity? If so, can these qualms be overcome? Should they?

3. Clinician Perspectives: Keyboard liberation

Physicians and informaticists have flagged their own set of concerns about transparency and appropriate use of health AI. At a recent Responsible AI for Safe and Equitable Health (RAISE) conference, attendees called for the setting of safeguards and priorities to maximize benefit and minimize risk in use of health AI. Recommendations included providing “model cards” that describe data, training, and evaluation details, similar to how food products are required to provide a nutrition label. The group also recommended that AI be prioritized for specific use cases, particularly to remedy current systemic shortcomings such as disparities in health access and diagnostic errors, and that AI tools be made available free or at vastly lower cost to poorer countries [27].

For many clinicians, the most promising use case for LLMs is what Eric Topol has famously termed “keyboard liberation” [28], a reduction of time spent documenting into electronic health records (EHRs). LLM-driven scribing systems, which listen to patient-clinician interactions and automatically generate large parts of clinical notes and after-visit summaries, are increasingly deployed in well-resourced, AI-capable healthcare systems [29]. Early reports are that both patients and clinicians feel more connected when the clinician is able to shift attention from the keyboard [30]. Additional promising applications of LLMs for clinical decision support are being pursued for radiation oncology, dentistry, neurosurgery, and psychiatry, among other specialties [31–34]. More generally, by allowing clinicians to shift their focus from screens back to patients and by taking over rote administrative tasks, the best case scenario is that generative AI will free up clinicians to practice “at the top of their license” and help reduce clinician burnout [35, 36].

The same advances that promise liberation, however, may also bring displacement. Discussion has been underway for nearly a decade about whether various physician roles–from radiologists to primary care providers–will be needed in an AI-enabled future, or whether replacement with AI-enabled avatars could reduce burden and increase healthcare delivery [37, 38]. LLMs currently are vulnerable to hallucinations, errors of fact or reasoning that limit their suitability for patient-facing applications in healthcare delivery, though performance can be improved through human correction (e.g., reinforcement learning through human feedback). Computer scientists are also working to boost performance by enabling quantification of uncertainty in the conclusions the models generate, and to finetune smaller, more healthcare-focused models and augment their built-in knowledge by connecting them to updated, external medical databases and peer-reviewed literature (e.g., retrieval-augmented generation). Diagnostic or treatment errors with “vanilla” LLMs (unmodified general purpose LLMs such as GPT, Llama, or Gemini) are a particular area of concern, as multiple studies show that, while these models can answer exam questions or analyze clinical vignettes correctly, they often produce diagnostic conclusions or responses that deviate from professional guidelines or

specialist recommendations when confronted with real-life, “noisy” medical data [32, 39–41].

LLM use suggests that clinician messaging, too, may benefit from fine tuning. A study comparing physician and AI chatbot responses to patient questions on a social media forum found that patients deemed the AI chatbot responses more empathetic [42]. However, just as answering a medical exam question does not fully capture what it means to be a good doctor, empathy in a single response may not encompass the depth of connection required in ongoing care. While LLMs can simulate empathy in isolated interactions, we doubt whether essential human qualities in the patient-clinician relationship–such as clinical intuition, emotional intelligence, subjective experience, and the ability to respond to a patient’s complex medical needs with attention to social and moral context –can be as easily replicated (Box 1).

Box 1 Essential Human Qualities in Patient-Clinician relationships

Empathic concern: genuine, emotionally engaged interest in learning more about the complexity of the patient’s point of view [43]

Solidarity: A move from “me” thinking to “we” thinking, and recognition that medical decisionmaking–even in personalized medicine–is shaped in dialogue with family, friends or clinicians, and moral and cultural values [44]

Epistemic humility: Awareness that data are always accompanied by uncertainty, and that consideration of the patient’s subjective experience is important to know the meaning and impact of diagnosis and treatment [45, 46]

Clinical intuition: Insight to facilitate diagnosis or treatment recommendations based on recognition of patterns, similarities or associations identified through experience and “gut sense,” even when not evident from medical records or data [47]

Therapeutic Alliance: Shared sense between clinician and patient that affirms the collaborative nature of the relationship, a shared emotional bond, and agreement on treatment goals and tasks [48]

Trust and psychological safety: Creation of environment where patients (and members of the care team) feel safe expressing their concerns, asking questions without feeling rushed or dismissed, or disagreeing with or exploring alternatives to clinical recommendations[49]

The risk of losing the human in the clinical encounter can also arise from structural causes. Analysts have warned that as health systems increase their use of AI, human clinical skills may degrade over time, particularly as LLMs increasingly ingest AI-generated data for training, creating a self-referential and increasingly machine-driven learning loop [14]. Automation bias–the belief that the machine-generated insights are more authoritative than they actually are–is only one among a number of concerns raised by those analyzing the potential negative impacts of importing LLM-generated notes into the EHRs [50]. In health systems where managed care has for some time cast physicians in the role of “double agents” tasked both with patient well-being and cost containment [51], it is easy to imagine AI exacerbating moral injury, with payors or health systems mandating or incentivizing clinicians to adhere to algorithmically determined actions even when these are in

conflict with their clinical judgment on how to best protect patient health. Fear of legal liability may add yet another strain, as courts seek to determine whether clinicians should pay or be penalized for malpractice when they relay erroneous recommendations from medical software or AI tools [52].

4. The Trilateral Interaction Framework: Generative AI as the Third Agent

The narrative of generative AI in medicine is still in formation. The patient-clinician relationship has historically been seen as the bedrock of medicine: even now, while the patient may have family caregivers and the clinician may practice within a clinical care team or health system, a direct, one-on-one human connection over time between patient and clinician remains the ideal. Generative AI now introduces a third agent that can be a disruptor, facilitator, or both, of communication, understanding, and connection between patients and their clinicians. We present a framework for describing and analyzing this new trilateral interaction, in which patients (and their surrogates) as well as clinicians at all skill levels avail themselves of the power of LLMs to review background information, secure diagnostic or therapeutic assistance, or navigate choices in our complex health system. We use the framework to trace the evolution of the patient-clinician relationship from pre-internet days, to consider possibilities for our current relatively early days of generative AI use in health, and to project to a future of more developed, agentic AI fully embedded in the clinical encounter.

Agentic AI, joining a range of AI tools to initiate actions autonomously according to tailored parameters, will represent an evolution beyond current generative AI capabilities. Unlike today's LLMs, which primarily generate text in response to user queries, agentic AI systems will learn from patterns of use, anticipate needs, and act proactively. For example, they might autonomously organize clinical data, flag potential drug interactions, or offer unprompted suggestions or questions for patients and providers to consider in recommending or adjusting treatment regimens, preventive strategies, or diagnoses. AI agents may also autonomously carry out actions in the virtual world such as typing into a computer or clicking on buttons (called "computer use") [53]– for example, submitting an order for medication renewal – or in the physical world, for example, changing the alert settings for a continuous glucose monitor.

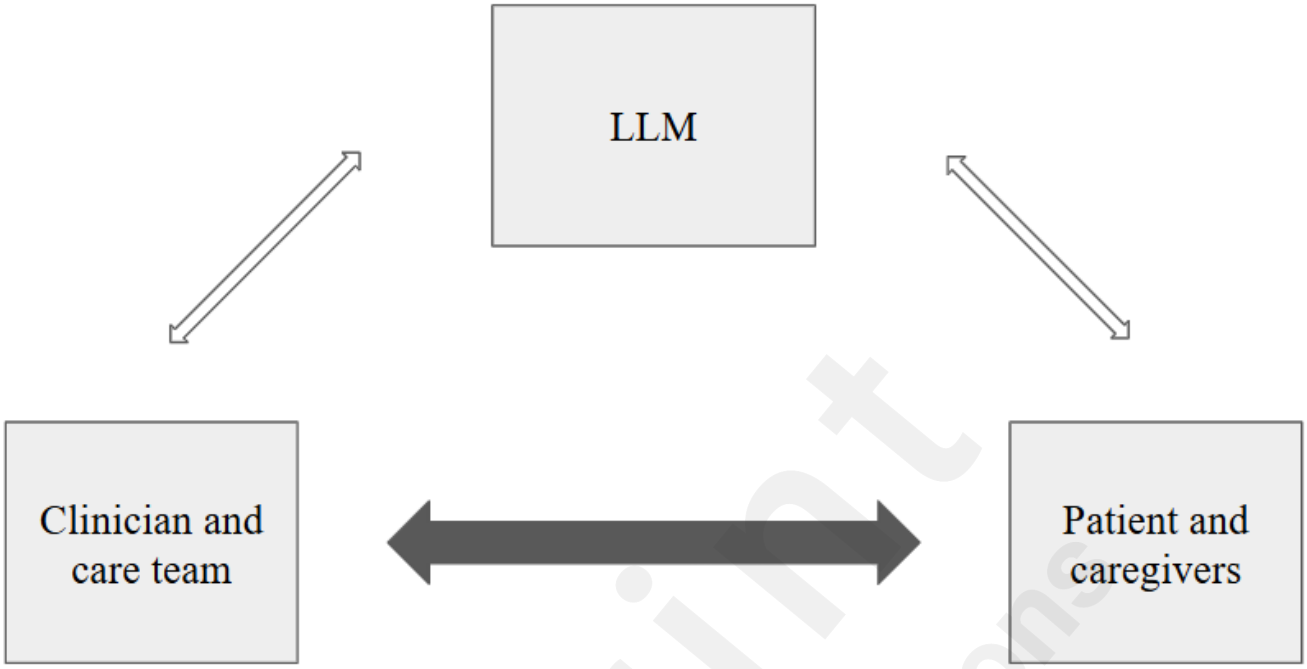

Figure 1: Trilateral Interaction Framework: Generative AI as the 3rd Actor in the patient-clinician relationship

Figure 1 illustrates the Trilateral Interaction Framework representing the situation today. The framework identifies the “corners” of the triangle as actors participating in the exchange of information. Two of the corners are inhabited by human actors: patients and their caregivers, and clinicians and clinical care teams. The third corner is now inhabited by LLMs, which are used by both clinicians and patients mostly through chatbots to generate content, analysis, and recommendations. Between these corners are “edges” representing interactions between human and machine, as well as between human actors: the darker the arrow, the more humanistic the interaction as characterized by essential human qualities of clinician-patient exchange detailed in Box 1. Since LLMs are currently mediating only a minority of exchanges between most patients and clinicians, the corresponding arrow in this figure is dark gray (indicating robust humanistic interactions).

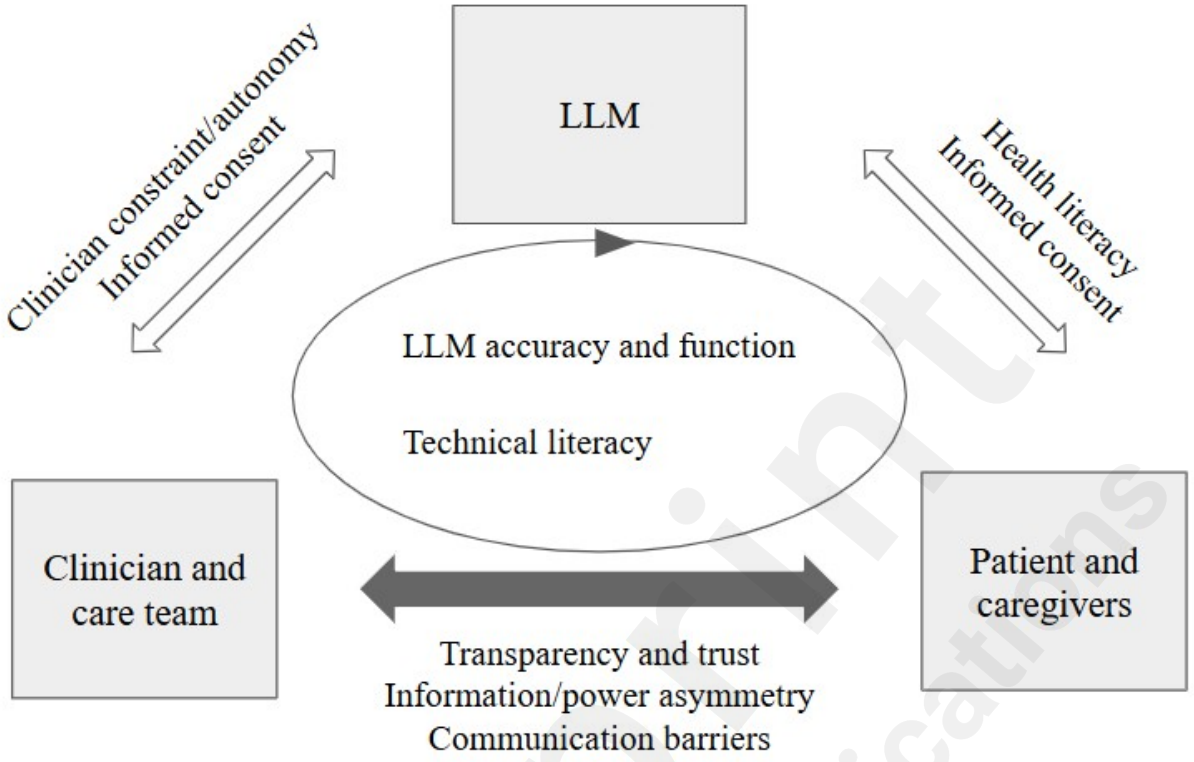

Figure 2. Mediators in the trilateral framework (patient-computer-clinician relationship)

Beyond the accuracy and functionality of LLMs, which impact all dynamics in the diagram, other factors mediate the nature of the bi- and trilateral interactions. These include patient health literacy, clinician autonomy within the healthcare system, trust and transparency in AI usage for both patients and clinicians, and asymmetries in power, information, and communication between patient and clinician (Figure 2).

The relative robustness of humanistic interaction between clinician and patient, indicated by the arrows at the bottom of Figures 1 and 2, reflects these early days of generative AI. Some health systems are deploying AI-generated “smart replies” to patients, but generally only for routine matters such as scheduling of appointments, prescription refills or the like, and only after clinician review and approval. Recent study of such AI-generated replies has found that clinicians deemed only 20 percent of drafts usable, though some clinicians did report decreased work exhaustion and cognitive load [54]. For their part, some “AI patients” have also begun to use LLMs to compose or clarify communications to clinicians. Today and in the future, a paramount concern is how these trilateral interactions will impact patients’ and clinicians’ sense of their own agency and trust in other humans, in AI, and in the overall healthcare system.

4.1 Pre-internet

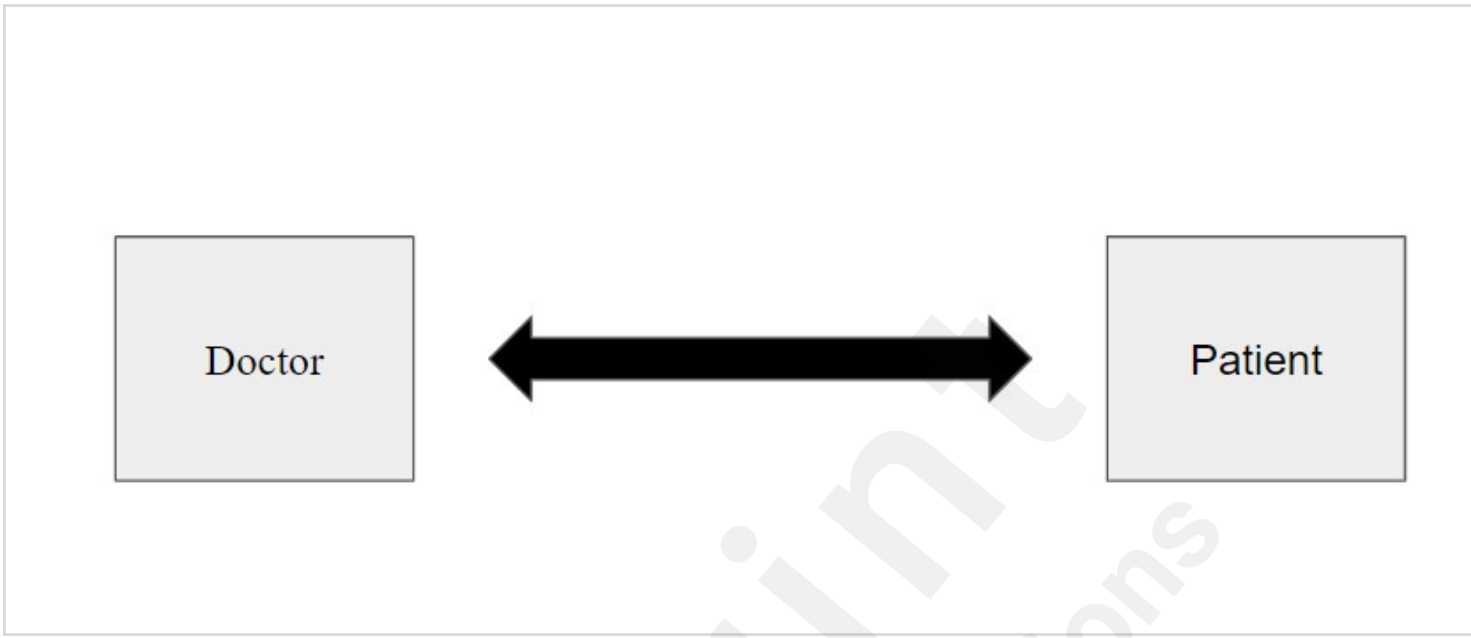

Figure 3: Doctor-patient relationship unmediated by technology

Figure 3 illustrates the “traditional” doctor-patient relationship, with the doctor as trusted confidante and authority. This model is centered around the doctor, who holds full decision-making autonomy and serves as the primary medical–and even, moral–adviser and point of contact for patients, superseding the significant roles that nurses and other caregivers play in delivering care. Characterized dually by patient trust and physician availability, this relationship–or at least its idealized form as portrayed in U.S. popular culture–is a long-term relationship woven from years of direct human interactions between doctor and patient [55, 56]. While Figure 3 positions doctor and patient on the same level, a more accurate rendering might place patient (and family) in a lower position, with the doctor holding knowledge and power of prescription, and patient and family in a recipient role that some have termed closer to a parent-child relation [57, 58]. As the interaction between doctor and patient is not being undermined or displaced by any digital agent or AI, the arrow between them is solid black.

Medical historians note that this view of the family doctor may already have been out of date for much of the 20th century in which this idealization predominated [59]. In any case, by the 1990s the hallmarks of that relationship – physician as carer for family, available for wise counsel, and with freedom and ability to take action as s/he deems fit to safeguard patient health– failed to obtain. The growth of managed care, capitation, and other health system changes contributed to this shift, while the rise of digital technology–especially EHRs, internet platforms providing medical information, patient access to their own notes, and the overall increase in patient self-advocacy–further accelerated it. [51, 56, 57, 60–62]

4.2 Near Future: Generative AI as interruptor?

Generative AI and chatbot interfaces can expand capacity for a range of healthcare actors, delivering new knowledge, predictive power or recommendations for action to physicians, nurses, physician assistants, and pharmacists, as well as to patients and their families. The capacity for multilingual

communication facilitated by LLM chatbots, while not fully evaluated for accuracy in medical information or when questions are asked in languages other than English, can also enhance understanding in families where patients or caregivers may not be native speakers.

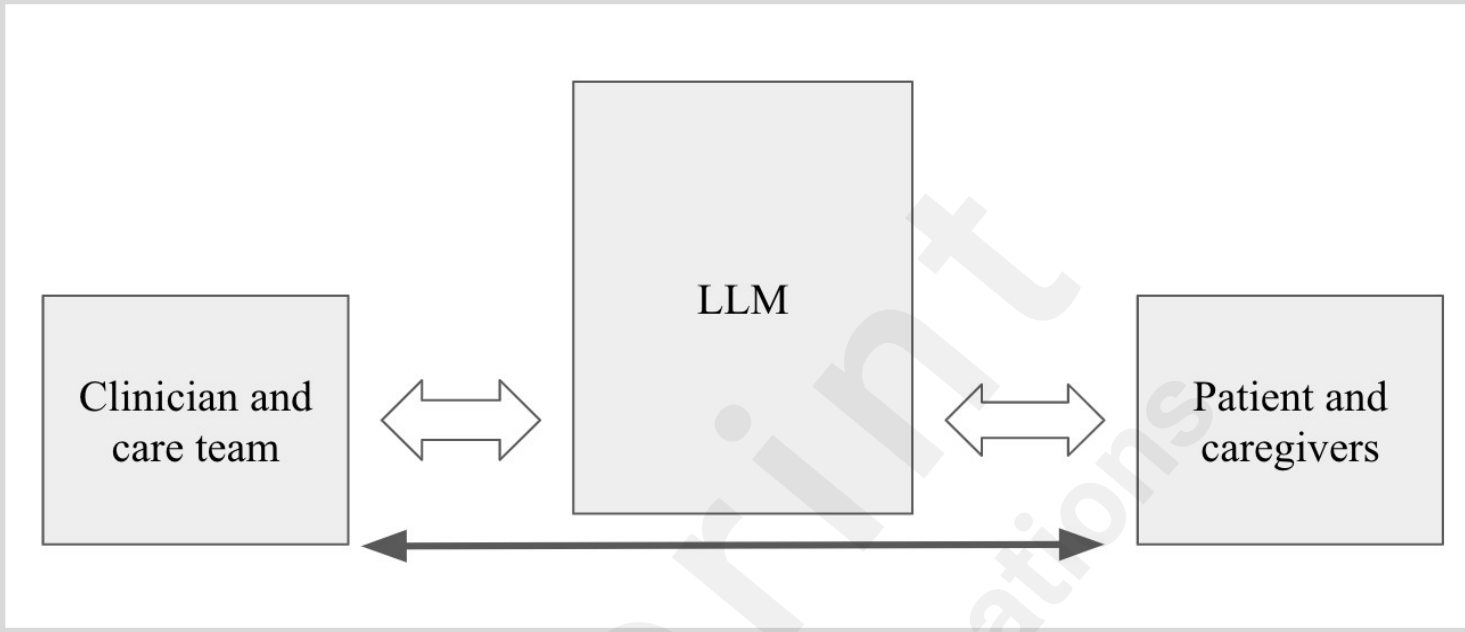

Figure 4. Generative AI as an interruptor: LLMs displacing humanistic exchange in clinician-patient interaction

This generative power, however, may diminish humanistic exchange. As LLMs improve their capacity to generate communications without human supervision or refinement, it is not difficult to imagine health systems using them as a substitute for, rather than facilitator, of human-to-human interactions (Figure 4). In some cases, the AI models–trained by health systems–may have goals that differ from those of doctors, leading to recommendations that prioritize cost saving over care, or that are less oriented to treatment plans that are sensitive to patients' moral or cultural values. Patient use of smartphone photos and LLMs for self-diagnosis of dermatological conditions, or use of ChatGPT to diagnose cause of stomach ache or cough without consultation with medical professionals, also represent scenarios where the LLM is less a facilitator of exchange between patient and clinician than its displacer [6, 63].

A future where patients might interact almost exclusively with AI agents, relying on AI decisions and recommendations, could enhance patient autonomy. Reductions in the humanistic qualities of interactions (represented by the thinner black arrow at bottom of Figure 4), however, risks loss of the therapeutic alliance, sense of shared purpose, and emotional connectedness that has been linked to a more positive patient and caregiver experience in conditions from psychotherapy to end-of-life oncological care [64, 65]. As noted in the anecdote above, where a patient had been interacting with an LLM without knowing it, this framework also suggests the need for new ethics governing trilateral, AI-involved medical exchange.

The health impact of these blurring of boundaries between human and generative AI and the diminution of human interaction are not yet clear. Generative AI's power to simulate human relations raises the question of whether machine-generated therapeutic alliances might be as "good" in some practical sense as those created through human interaction. Might generative AI someday

reproduce all the qualities in Box 1? Elderly Japanese patients have experienced decreased loneliness with therapeutic robot pets, like small mechanical seals [66], and children with developmental difficulties have found benefit from robot playmates [67]. Generative AI may possess similar or greater powers of comfort. At the same time, as psychiatrist and medical anthropologist Arthur Kleinman reminds us, caregiving is relational and reciprocal, including both a range of physical acts–touch, embrace, lifting, steadying, toileting, and more–as well as the way we look at another human being, receive their gaze, experience a quality of voice or physical presence as an expression of solidarity and support [68]. For Kleinman, and countless patients and families, these essential elements of human care had become mechanized and inauthentic in much of modern healthcare even before the advent of generative AI. The ineffably human dimensions of care–those moments of connection, physical presence, deep empathy and moral solidarity– will be difficult to replicate for even the most sophisticated language models, no matter how well-prompted or finely-tuned.

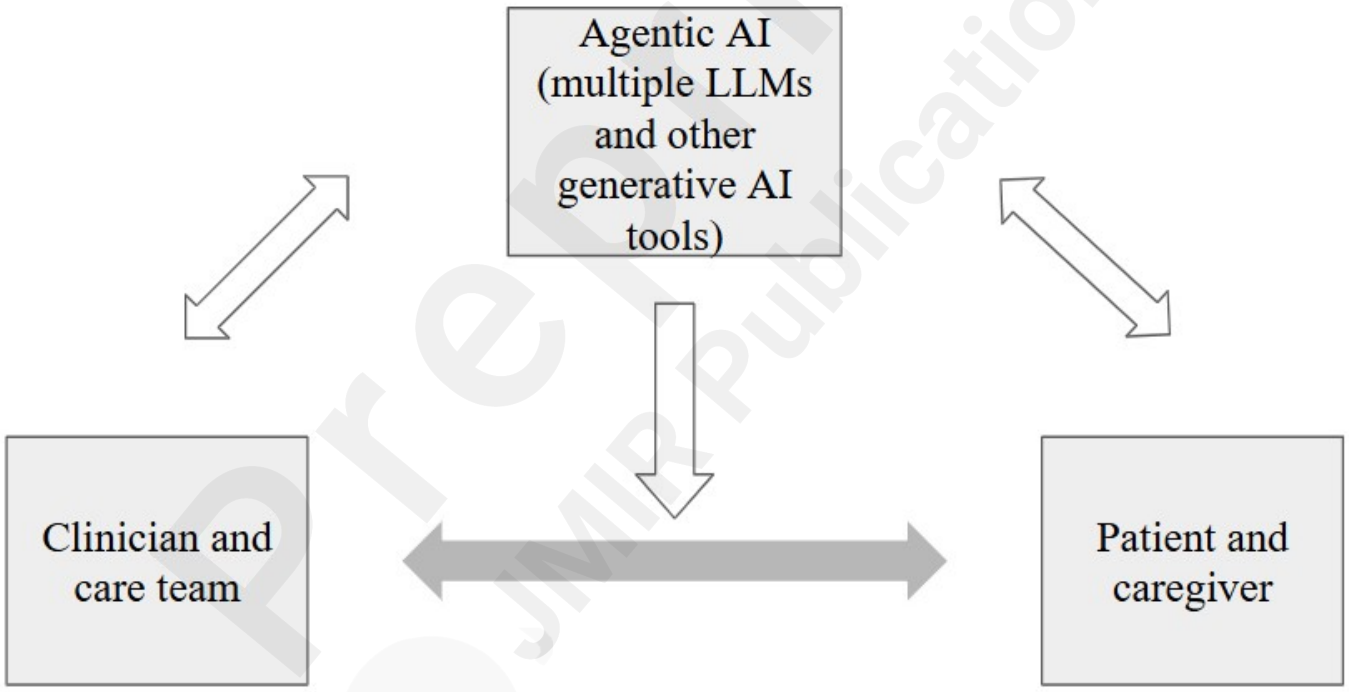

Figure 5. Agentic AI as a facilitator between clinician and patient

4.3 Farther Future: Agentic AI as Ally/Facilitator

We imagine a future where generative AI evolves beyond prompted responses from chatbots to become what is termed “agentic AI”–systems capable of initiating autonomous action in the virtual

and physical world, potentially but not necessarily serving as loyal assistants while preserving human agency. In this scenario, AI can become allies for clinicians, patients, and their respective care teams, facilitating rather than replacing their essential partnership (Figure 5). For clinicians, agentic AI would embody what analysts have termed “assistive intelligence”[69]–that is, not making decisions but enhancing decision-making capacity, parsing clinical records, initiating routine tasks like prior authorizations, assessing medication interactions and recommending treatment regimens or preventive strategies tailored to individual patient needs. For patients and their caregivers, agentic AI similarly would not replace clinical input or personal experience, but could serve as both navigator and advocate, organizing clinical records and synthesizing data and medical knowledge to illuminating health determinants and advisable courses of action.

Making complicated medical information more comprehensible, agentic AI could also help patients advocate for themselves, recommending strategies to increase patient autonomy and independence, while identifying attempts by healthcare or insurance systems to limit patient choice or impose unwanted treatment pressures. For physicians, AI agents could be tailored or trained to their clinical preferences and style, learning patterns and combinations of treatments, manner of communication, instances where additional tests would prove useful, and lessons from past communications. In this vision, both patients and clinicians may come to view their AI tools, implicitly or explicitly, as “theirs”–that is, trained to serve their specific interests. The embedding of agentic AI in the clinical relationship could nonetheless align patient and clinician in working toward shared outcomes. Note that the arrow indicating robustness of humanistic exchange between patient and clinician in this scenario is neither black nor unshaded, but rather shaded medium gray: while AI would assist in mediating communication, it could potentially enhance, rather than eclipse human exchange.

5. Research Agenda: Generative AI for Participatory Medicine

5.1 LLM use, function and safety in the clinician-patient exchange.

The newness of generative AI as a third agent in the clinician-patient relation raises multiple questions–as yet largely unanswered–on whether these new models are fit for purpose. How will patients or clinicians use “their” AI to organize information? How well or safely will the tools perform the tasks required? How will use vary? While answers are likely to change rapidly with field advances, key research directions include:

> *Human use of general-purpose LLM chatbots (e.g., ChatGPT, Gemini) in health and healthcare.* Rapid uptake of these tools, and rapidly growing capacity to ingest images, PDFs, and increasing numbers of words, makes understanding current and potential uses by patients and clinicians critical to understanding likely trajectories for general purpose LLMs and those fine-tuned for healthcare applications (see 5.2, below). Key questions include clinician assessment of accuracy of responses to patient queries, and patient assessment of intelligibility of LLM responses, including for those with different English language or educational levels, technical literacy, etc. What is the impact of biases or style embedded in particular LLMs, and how might those interact with patient need or preference? As with training of AI models, research on LLMs as third agents will require diverse data sets and participants, including patients with different English language or educational levels, comfort and familiarity with computer interfaces, and Internet access, as well as preferences for

communication and action recommendations in healthcare.

Customization and optimization of LLMs for specific clinical purposes (e.g., diagnosis, care navigation) for specific users, whether clinicians, patients or caregivers. The research agenda here should examine both proposed solutions and methods development – including but not limited to pre-training of focused foundation models, incorporation of symbolic knowledge, quantification of uncertainty in estimates produced, and methods for fine-tuning and de-biasing. Optimization work, with particular attention to RAG (retrieval augmented generation), is being carried out in both industry and academia, with industry likely to progress more rapidly given their disproportionate access to large-scale compute capacity. This raises collateral but related research questions on healthcare markets and incentives, including regulatory requirements in marketing and labeling of generative AI in health, potential impact of use agreements between particular LLM or EHR vendors, and differentials in use or constraints to use varying by healthcare system (public v. private), budget, geography, etc.

5.2 Mediators in generative AI use: health literacy, trust and transparency, clinician-patient power dynamics and beyond.

Participatory medicine emphasizes reducing information asymmetries and increasing trust as key to enabling patients and caregivers to become more effective partners in the clinical setting. Understanding the "edges" in Figure 2–that is, the factors mediating relations between the agents in the trilateral framework of patient, clinician and agentic AI–raises a range of research questions beyond assessment of LLM function. Priorities for this research include:

Approaches to health and technical literacy. How does patient empowerment increase numeracy, critical thinking, or effective use of one or more LLM chatbots? Current versions of general purpose LLMs do not cite sources or rank them by accuracy, leaving patients to distinguish between hallucination and reality, and between more and less authoritative sources of information. What strategies can be used to increase patient comfort with LLM use, comparison between models, and ability to distinguish between recommendations based on low or high strength of evidence or rigor of sources? Literacy in data import/access is also variable–while all patients now have the ability to access medical records from across multiple health systems, knowing how to do that and how to feed results to LLMs will determine whether or not these tools significantly alter information asymmetry.

Informed consent and ethical use. For patients, what is understood regarding privacy, informed consent, or ability to opt out when their data is used by health systems to train LLMs? When they upload their personal medical data via a chatbot, what do they understand about uses that can be made of that information? ChatGPT is now used, with apparent success, to simplify informed consent forms for both clinical research and prior to surgical procedures [70]. But how informed are clinicians themselves about potential use of their practice patterns to train generative AI, or their options for participation or exemption from such research? Guidelines urging AI that is "FAVES" (fair, accurate, verifiable, effective and safe") or calls for centralized laboratories to evaluate health AI safety and effectiveness are important, may be insufficient either address such questions as impact of LLM function drift over time, or to assess and address impacts of LLM use on health outcomes or workforce morale at point of care [1].

Transparency and trust. We cite an instance above of patient disappointment upon discovering that her interlocutor was in fact a chatbot rather than a human provider. What is the impact of disclosure by patients, physicians, and health systems of generative AI use, or of not disclosing at all? One study of "smart replies" outside the health domain found that when participants think their communication partner is using AI-generated responses, they perceive them as "less cooperative" or "affiliative." When AI's role in authoring the responses was unknown, those receiving them judged their interlocutors to be more cooperative collaborators [71]. Whether or how patients and physicians reveal use of AI assistance, under what circumstances this is judged a positive or negative, and whether perception on the benefits of LLM use varies by patient or physician type, health condition, or health system, are all questions of interest. Measurement of trust and partnership needs to begin with the design stage: inclusion of patients in the co-creation of research methods and aims is central to research success [26].

Removal of communication barriers and gains in efficiency. With physician shortages projected to reach 86,000 in the United States within the next decade [72], how will LLM use allow existing clinicians to do more, or reduce need by clinicians and patients for in-person exchange? What kind of upskilling or increased capacity might be conferred to nurses, physicians assistants or other care providers to relieve strain on primary care provision? How might patient use of these tools, or of AI-generated summaries of key data points (including from different health systems, from wearable data inaccessible via the EHR, etc.), speed or improve communication with clinicians?

Clinician constraint and autonomy. Clinician priorities and commitment to care are not necessarily aligned with health system priorities. Whether generative AI's potential in the health system is realized depends in part on whether the cost of deploying and maintaining the innovations is offset by increased incoming revenue or decreases in the expense of replacing burned-out clinicians. Regulatory or liability concerns may also constrain health systems or physicians, leaving patients freer than clinicians in some instances to explore LLM-generated insights about their conditions. How or if limits on clinician autonomy impact the use of generative AI, physician sense of self-efficacy or cognitive load, and patient experience are all research questions of interest.

The value of the human in care. The importance to patients of human caring in healthcare in the age of generative AI, or the degree to which clinicians value their role or humanistic exchange as integral to a process of caregiving, is not yet known. This may vary by patient, condition, specialty or primary care, or health system, and depend on patient access to or help from other human actors, including family and other service providers. As electronic communication between patients and clinicians grows, and particularly as health systems imagine avatars of clinicians assisted by agentic AI, the question of how much human exchange is needed and what is essentially human about such exchange, will become increasingly central.

6. Conclusion

The entry of generative AI as a third actor in the clinician-patient dynamic opens new possibilities for change. Clear-eyed research into both function and use of generative AI can help bend the arc of that change toward mutual benefit for patient and clinician. Rather than insisting on the primacy of

clinician-patient interaction, we recognize generative AI as a new agent in the healthcare dynamic. Rather than advancing AI as a replacement for human intelligence or interaction, we conceptualize something closer to assistive intelligence, a force enhancing and facilitating patient-clinician engagement, supporting sound clinical decision-making and improved communication, and ultimately improving both health outcomes and patient-clinician partnership.

Understanding the impact of generative AI on clinician-patient relations will require social science and computer science, qualitative research as well as quantitative analytics and software engineering. While a focus on clinician-patient interactions is insufficient to address the multiple incentives and forces that underlie the American healthcare system, understanding the dynamics of those interactions–and acting to design, train and use LLMs in ways that reinforce humanistic collaboration–is necessary. Scientists, clinicians, patients, and health systems will benefit from research that respects principles of engagement, co-creation and ethics emerging from patient movements. By fostering collaboration between technologists, healthcare providers, and patients, we can create a future where AI serves as a facilitator strengthening the communication and connection at the heart of human-centered and effective care.

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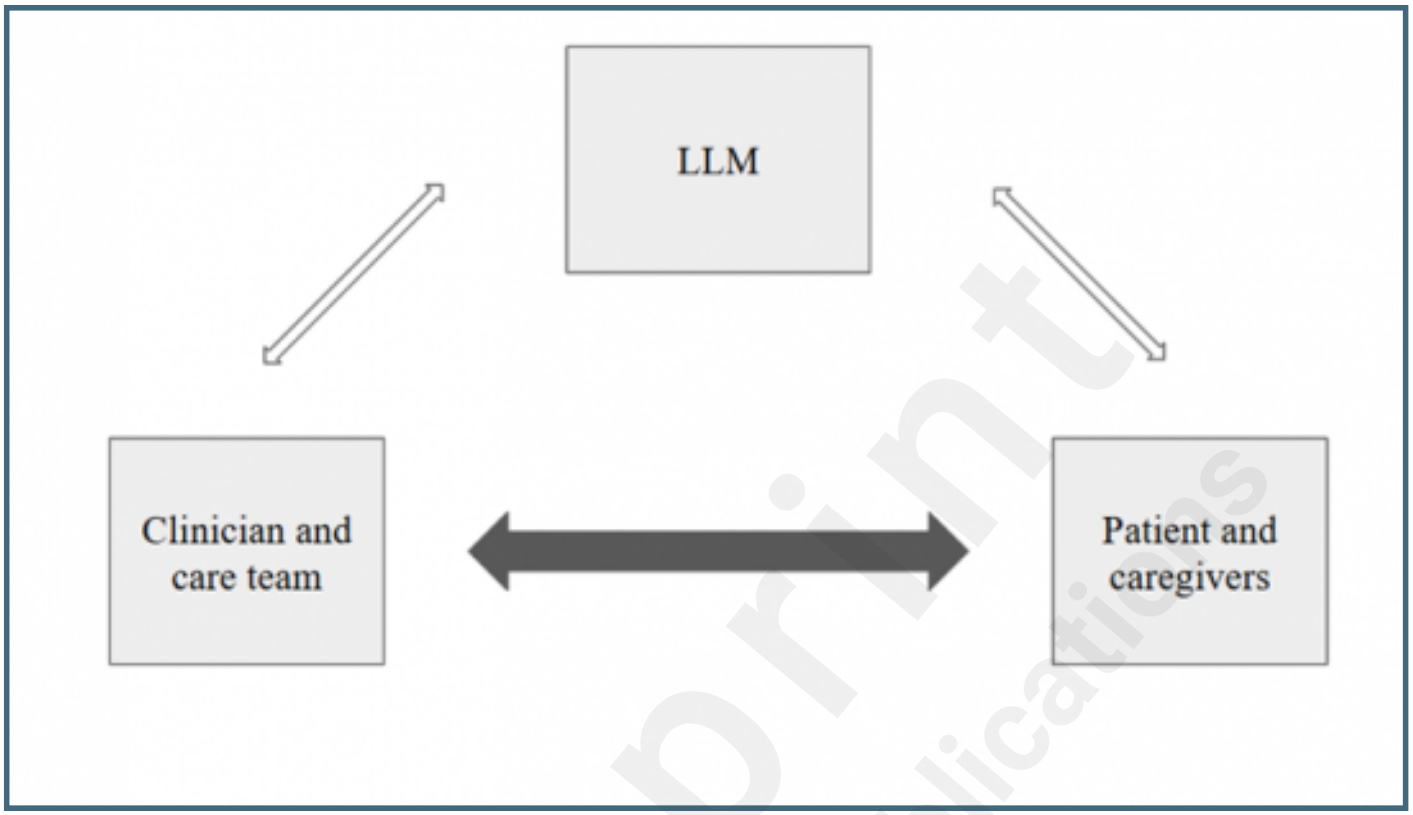
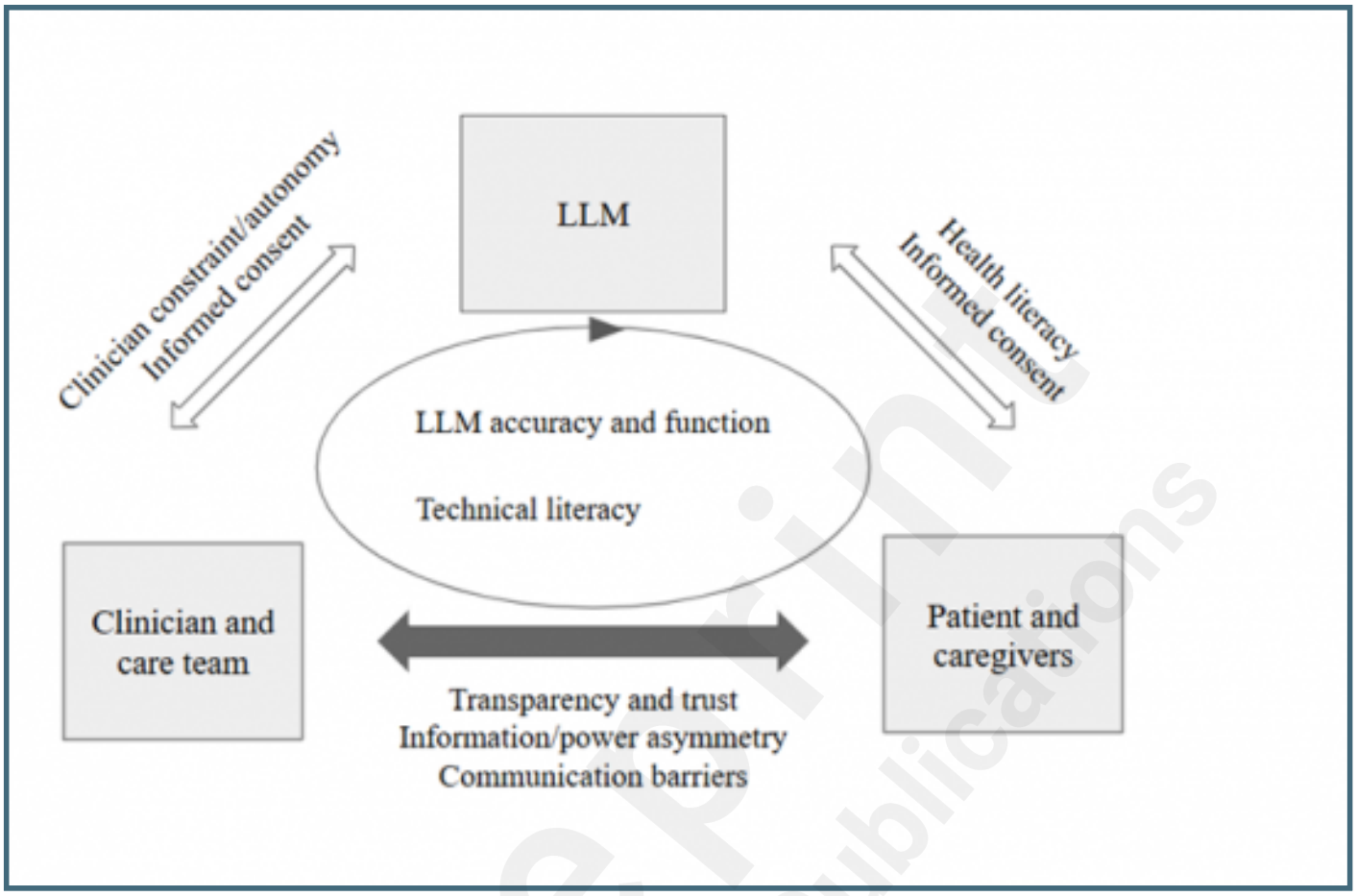
Supplementary Files

Figures

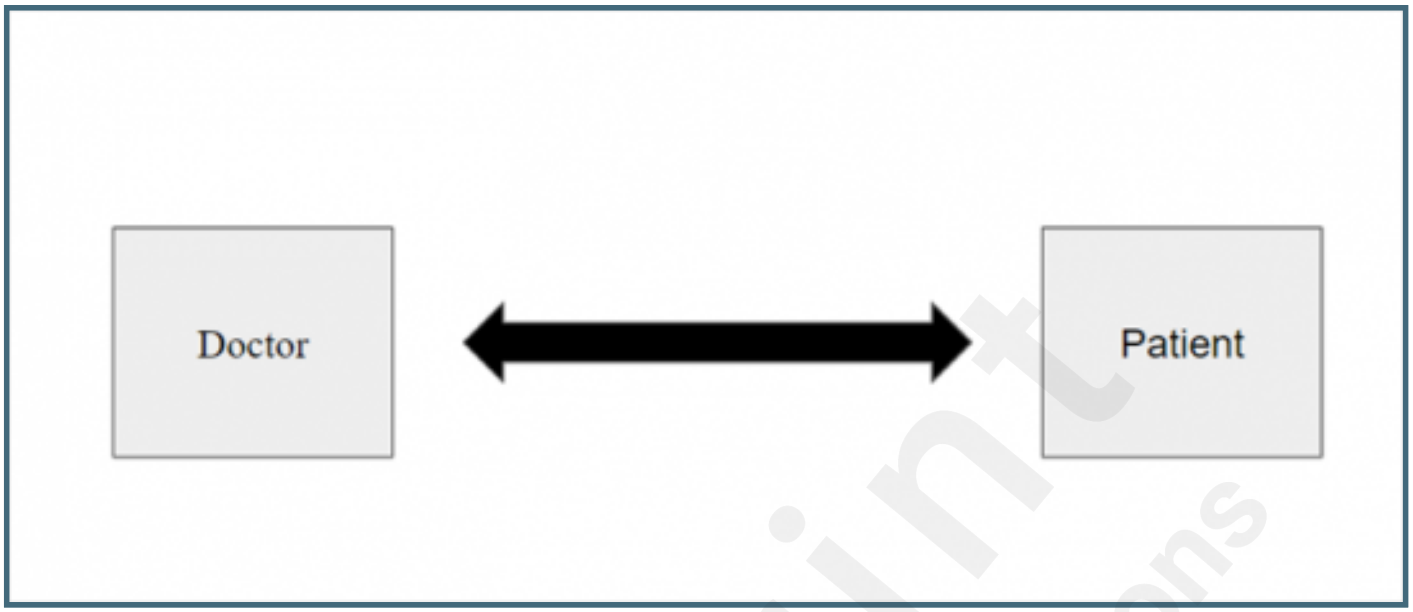
Today's trilateral interaction framework: Generative AI as the 3rd actor in the patient-clinician relationship.



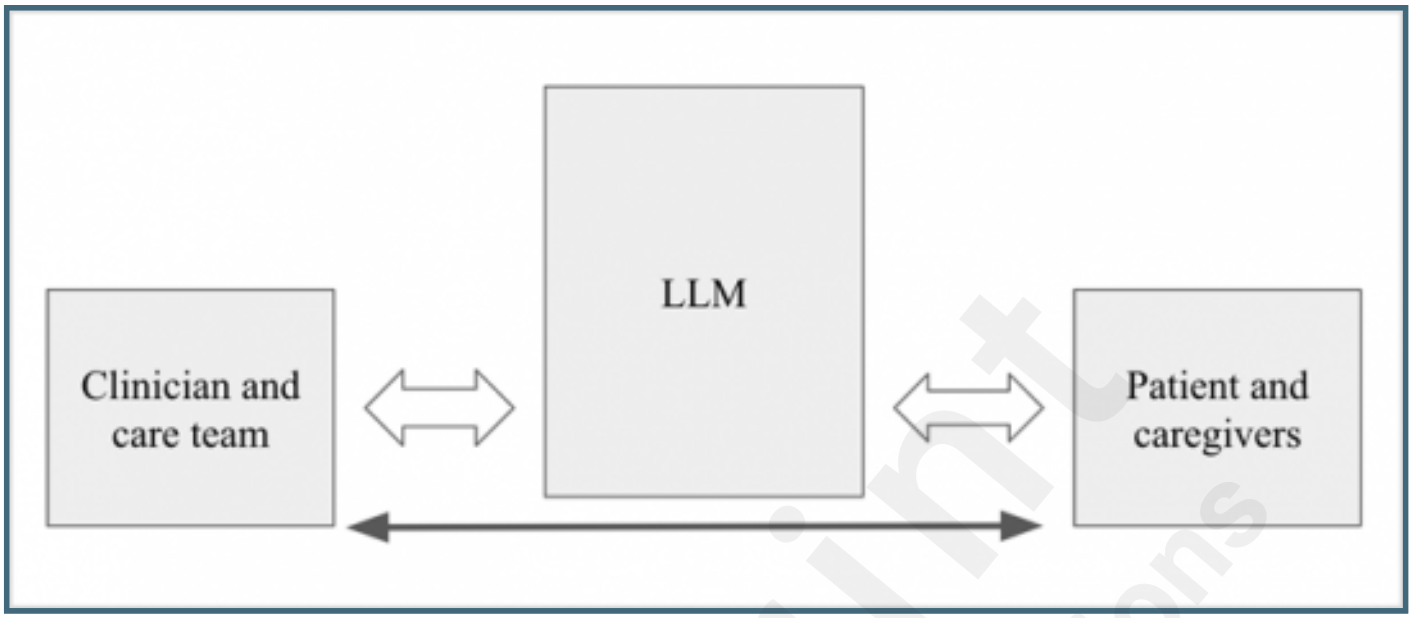
Mediators in the trilateral framework (patient-computer-clinician relationship).



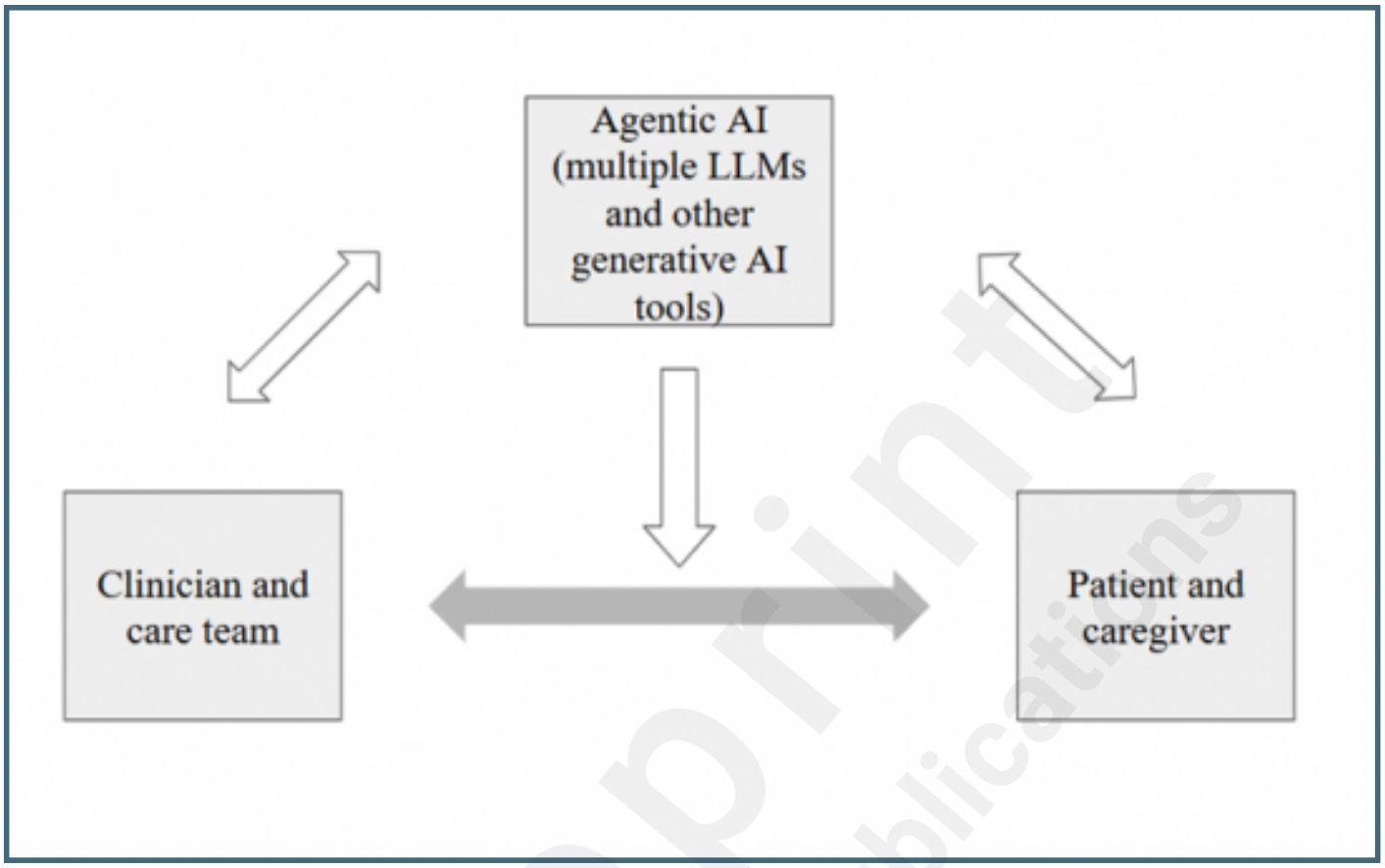
Doctor-patient relationship unmediated by technology.



Generative AI as a interruptor: LLMs displacing humanistic exchange in clinician-patient interaction.



Agentic AI as a facilitator between clinician and patient.



Multimedia Appendixes

Prompts and outputs from LLMs.
URL: http://asset.jmir.pub/assets/8671128385aaeeb50e822cf92b3f2456.pdf