



The Swiss army knife illusion: Preserving the human dimension in the age of AI



Perspective

We are living through a period of profound epistemic and technological transformation. Artificial intelligence (AI), increasingly deployed in medical diagnostics, decision support, and clinical workflow, generates both excitement and concern, with recent applications spanning areas such as gastrointestinal and hepatic oncology, where deep-learning-based approaches have demonstrated promising diagnostic performance.¹⁻³ Despite the growing visibility of artificial intelligence within medical research, its translation into everyday clinical practice remains limited.

While many AI models have been proposed, only a relatively small subset has demonstrated the level of safety, interoperability, and contextual reliability required for sustained use within real-world clinical workflows. In many cases, these systems continue to operate within experimental, retrospective, or pilot environments rather than routine care.

Recent evaluations point to a persistent “operationality gap” between algorithmic performance under controlled conditions and effective clinical deployment. This gap may reflect unresolved issues related to workflow integration, clinician oversight, system accountability, and institutional barriers to implementation.⁴⁻⁶

From a clinical and ethical perspective, this gap also raises economic considerations, as resources invested in AI-based solutions may compete with interventions that have established patient benefit. In this context, rigorous prospective evaluation, transparent reporting standards, and outcome-focused validation frameworks remain essential for the responsible incorporation of AI into medical practice.

At the same time, as technological capabilities expand, broader questions emerge about the role of human presence in the healing professions. In accordance with emerging guidance on transparency in the use of artificial intelligence in academic publishing, including the TITAN reporting framework,⁷ this perspective follows principles of responsible declaration and human authorship. These principles align with broader international guidance on the ethical governance and responsible clinical implementation of artificial intelligence in healthcare, including World Health Organization guidance on AI ethics and widely adopted reporting frameworks for AI-based clinical research such as the CONSORT-AI and SPIRIT-AI extensions.⁸⁻¹⁰

Editorial standards from organizations such as the International Committee of Medical Journal Editors (ICMJE) and the Committee on Publication Ethics (COPE) also emphasize that gener-

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ative AI tools cannot be credited as authors and that their use must be transparently disclosed in scientific publications.^{11,12} Consistent with these principles, this manuscript complies with Elsevier's policies regarding the responsible use of generative AI in scholarly writing, which require clear disclosure and confirm that ultimate intellectual responsibility remains with the human authors.¹³ No generative AI tools were used in the conception, drafting, or revision of this manuscript beyond standard linguistic editing. In this perspective, the first-person singular reflects the personal clinical and existential experience of one author, while the coauthors contributed to the ethical framing and surgical contextualization and fully endorse the arguments presented.

Earlier this year, I was diagnosed with multiple sclerosis. Reading the medical report, I recognized only my name. The complexity and abstraction of the language created a sense of distance from my own body. Seeking clarification, I consulted an AI model. The reply I received was technically competent and understandable. Yet its opening sentence was striking: *"First of all, I'm very sorry."*

In that sentence, the long evolution of human relationships and ethical sensibility appeared strangely compressed. The gestures traditionally associated with care—gaze, touch, reassurance—seemed absent. The evolution of human language appeared reduced to an automated expression of sympathy. Tears, tenderness, care, concern, and compassion—elements often associated with human experience—were condensed into a phrase without lived context or emotional history.¹⁴

"First of all, I'm very sorry." Yet such expressions highlight an important distinction. AI systems cannot experience another person's suffering or joy. They do not possess subjective awareness or emotional experience. AI systems also lack physical embodiment and therefore cannot engage with the world through sensation or relational presence.¹⁵ As a result, they cannot assume moral responsibility for another person's well-being in the way that clinicians do.¹⁶

Human reasoning, by contrast, reflects a complex interplay of cognitive and emotional processes—imagination, memory, emotion, rationality, practical judgment, and experience. Even seemingly simple acts of appreciation or evaluation, such as recognizing the qualities of a fine wine, illustrate the layered nature of human understanding.¹⁷

Human reasoning also often engages with tension and ambiguity. Individuals frequently navigate competing values—autonomy and responsibility, independence and interdependence, solitude and community. In many contexts, such tensions become spaces where reflection and growth occur.¹⁸

AI systems do not engage in this type of experiential reflection. Although generative models can produce new outputs, they do so through statistical recombination of existing data rather than through lived experience or intentional understanding. In this sense, AI systems can generate responses without possessing sentience, subjective awareness, or moral agency.

What is therefore at stake may not be a competition between humans and machines, but rather the preservation of those relational and interpretive dimensions that characterize professional care. Medicine—and surgery in particular—often involves navigating uncertainty, responding to suffering, and engaging in relationships that require empathy, judgment, and accountability.

AI should therefore be understood as a powerful tool rather than a replacement for human professionals. When used responsibly, AI may support clinicians in formulating questions, analyzing complex information, and exploring diagnostic or therapeutic possibilities. In this sense, interaction with AI can function as a mirror that reflects the quality of the questions clinicians ask and may help refine clinical reasoning.

From this perspective, AI may also function as an "anthropological provocation." Engaging with AI systems can prompt renewed reflection on what it means to reason, to interpret evidence, and to exercise judgment in complex situations. Such reflection recalls long-standing philosophical traditions, including Aristotle's concept of practical wisdom (*phronesis*) and the notion of discernment (*diakrisis*), both of which emphasize reflective judgment in contexts of uncertainty.

Ultimately, the presence of AI in clinical practice may serve as a reminder that wisdom is not defined solely by the quantity of information available but also by the quality of the questions

clinicians ask. In medicine—as in many areas of human activity—interpretive judgment remains central to responsible decision-making.

Rather than framing AI through extremes of enthusiasm or fear, it may be more productive to consider how technological innovation can coexist with the relational and ethical dimensions of care. Clinicians continue to be called to exercise judgment, discernment, and responsibility in navigating complex realities.¹⁹

This important responsibility leads us to the conclusion, which of course is a series of questions: will we surrender human intelligence to the promises with which AI is clothed—knowing and being able to do everything effortlessly like a Swiss army knife? The risk we run, I believe, is disposing of human existence (effort and creativity included) under the illusory promise of optimizing or improving human life by eliminating the future as a source of concerns, and therefore eliminating creativity and imagination.

Can we yield to such a reductive vision of the human being? Will we surrender and reduce the nobility of our work to merely solving problems and concerns? Would we compress the humble greatness of the human being by reducing it to a character like Disney's Fix-it Felix? Wouldn't that be giving in to a machine-like hyper performative behavior and, ultimately, giving in to fear of the present life and fear of the future?

Implications for surgical practice in the age of artificial intelligence

While the reflections presented here may appear primarily philosophical, their implications are immediately tangible within contemporary surgical practice, where artificial intelligence is progressively entering clinical environments through decision-support systems, predictive analytics, automated documentation, and digital communication tools.

In the preoperative phase, AI-driven predictive models are increasingly used to estimate operative risk, stratify patients, and support clinical decision-making. These tools may enhance the precision of risk assessment and provide valuable information during shared decision-making with patients. Yet algorithmic probabilities cannot substitute the interpretative role of the surgeon. Surgical judgment remains essential in translating statistical predictions into meaningful conversations that take into account the patient's values, expectations, and individual circumstances.

During the perioperative phase, AI-assisted technologies may generate operative documentation, summarize clinical information, or support handoffs between surgical teams. Such systems can improve efficiency and reduce administrative burden. Nevertheless, the responsibility for interpreting clinical information, recognizing contextual nuances, and ensuring continuity of care remains firmly human. Surgeons must critically evaluate algorithmically generated summaries to ensure that essential clinical details are not lost in automated processes.

In the postoperative phase, AI tools may contribute to monitoring outcomes, generating discharge summaries, or facilitating digital patient communication. However, postoperative care frequently involves moments of uncertainty, vulnerability, and emotional distress for patients and their families. In these contexts, human presence, empathy, and the capacity to respond to suffering remain irreplaceable components of surgical care.

Seen from this perspective, the integration of artificial intelligence does not diminish the role of the surgeon; rather, it clarifies it. The surgeon becomes not merely a technical operator within a technologically augmented system, but a moral and relational agent responsible for interpreting data, guiding decisions, and accompanying patients through uncertainty. The emergence of AI therefore calls not only for technical competence, but also for renewed attention to the ethical and humanistic foundations of surgical practice.

An additional dimension that warrants careful attention is the potential impact of artificial intelligence on health equity and patient safety. AI models are trained on historical datasets that may not adequately represent the diversity of patient populations encountered in real-world clinical practice. As a result, algorithmic systems may exhibit biased performance when applied to under-represented demographic groups. Furthermore, phenomena such as model drift

and distribution shift—where the characteristics of patient populations or clinical environments evolve over time—may lead to progressive deterioration in model performance if systems are not continuously monitored and recalibrated. These challenges highlight the need for rigorous external validation, transparent reporting of dataset composition, and ongoing surveillance of algorithmic performance across diverse patient populations.^{20,21} For surgeons and healthcare institutions, maintaining awareness of these potential biases is essential to ensure that the integration of artificial intelligence enhances, rather than compromises, equity, safety, and trust in surgical care.

Practical recommendations for surgeons and surgical educators

As artificial intelligence tools progressively enter surgical environments, several practical principles may help ensure that their integration supports, rather than diminishes, the humanistic foundations of surgical care. These principles are increasingly reflected in international guidance on the responsible governance, evaluation, and clinical implementation of AI systems in healthcare.^{8–10,22} The following considerations may guide clinicians and educators navigating AI-assisted clinical practice:

- Ensure transparent disclosure when AI tools inform clinical decisions. Patients should be informed when algorithmic systems contribute to diagnostic interpretation, risk prediction, or treatment planning.
- Maintain a clear clinician-in-the-loop model. AI systems should function as decision-support tools rather than autonomous decision-makers, with the surgeon retaining ultimate clinical responsibility.
- Document the role and limitations of AI systems in the medical record. Transparency regarding the scope, uncertainty, and limitations of algorithmic outputs has been emphasized in emerging standards for trustworthy AI in healthcare.
- Develop simulation-based training on AI literacy and interpretability. Surgical education programs should incorporate training modules that teach clinicians how to critically interpret algorithmic outputs and understand model limitations.
- Establish escalation pathways for conflicts between AI outputs and clinical judgment. Institutions should define clear procedures for situations in which algorithmic recommendations diverge from the surgeon's assessment.
- Promote interdisciplinary oversight of AI implementation. Collaboration among surgeons, data scientists, ethicists, and institutional leadership can support responsible adoption and continuous evaluation of AI technologies.
- Preserve the primacy of the surgeon–patient relationship. Even in technologically augmented environments, the ethical core of surgical care remains the interpersonal encounter through which trust, empathy, and shared decision-making are established.

As a personal reflection on the ethical meaning of care and professional responsibility, I would like to conclude with a passage from Pope Francis that resonates with the themes discussed here: «[Human] fruitfulness is often invisible, elusive and unquantifiable. We can know quite well that our lives will be fruitful, without claiming to know how, or where, or when. We may be sure that none of our acts of love will be lost, nor any of our acts of sincere concern for others. No single act of love [...] will be lost, no generous effort is meaningless, no painful endurance is wasted».²³ These are not metaphysical consolations; they are professional truths. They remind us that our work is not just to repair tissue but to bear witness to the dignity of suffering.

Artificial intelligence may be fast, efficient, and seemingly omniscient. But it cannot hope. Only humans can.

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