Intelligent Oncology 1 (2025) 189–192

Contents lists available at ScienceDirect

Intelligent Oncology

journal homepage: www.keaipublishing.com/en/intonc/

Editorial

The new paradigm for global oncologists in the era of generative AI

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At the start of 2025, DeepSeek sparked a global wave of general artificial intelligence (AI) applications in medicine.[1–3] Currently, large language models (LLMs) such as GPT-4o, DeepSeek-R1, Gemini 2.0, Command-R, Claude 3, Qwen, and Grok 3 exhibit distinct characteristics but a shared strength in advanced logical reasoning. This strength has the potential to significantly impact medical decision-making models.

Since the medical AI model Med-PaLM successfully passed the United States Medical Licensing Examination,[4] both general and specialized large models have rapidly expanded, accelerating the medical sector's transition from an Internet+ to an AI+ paradigm. For oncologists, this transformation presents both opportunities and challenges.

The new *Intelligent Oncology* journal is committed to advancing emerging AI technologies to provide both theoretical and practical foundations for clinical applications. At the same time, we look forward to offering opinions on generative medical AI for future oncologists. As we write this editorial, the convergence of the technological revolution and medical mission in the era of human–computer interaction (HCI) is reshaping the career landscape for oncologists.

Reshaping of the talent training system

Traditional learning models acquire relevant knowledge by reading the latest literature—a time-consuming process. With the rapid deployment and local implementation of LLMs, significant changes are expected in how oncologists acquire medical knowledge.

Recent advancements in LLMs enable rapid analysis of scientific literature at scale. With domain-specific training, these models quickly approach human expert performance in standardized scenarios with high accuracy.[5] Many studies have shown that AI-enhanced education systems may accelerate the integration of medical knowledge into clinical practice.[6,7]

In terms of learning paths, AI can generate dynamic learning plans based on the types of cases doctors handle, their research directions, and knowledge gaps. The rapid deployment of medical LLMs introduces new requirements for doctors' capabilities (Figure 1):

(1) Model thinking: Understanding the probabilistic reasoning mechanisms of LLMs and accurately assessing the confidence intervals of AI recommendations for clinical decision;

(2) Second-layer judgment: Making optimal choices among AI-provided treatment plans by considering patients' socioeconomic conditions;

(3) Knowledge engineering capabilities: Developing basic skills and improving medical database to provide accurate feedback so as to guide AI in optimizing knowledge graphs.

Medical education institutions must quickly adapt their teaching models to break free from the constraints of traditional medical education.

Evolution of clinical decision-making paradigms

The uneven distribution of medical resources and the suboptimal implementation of standardized treatments limit improvements in cancer treatment outcomes globally. Even in developed countries, conventional decision-making is hindered by variations in doctors' experience levels. These differences can be quickly mitigated with the implementation and widespread adoption of medical LLMs.

New HCI models will rapidly expand the dimensions of diagnosis and treatment. The diagnostic capabilities of imaging and pathology will be significantly enhanced, with numerous AI-assisted diagnostic software programs reaching expert levels. This improvement will be particularly evident in primary hospitals and rural clinics.

Meanwhile, many LLMs can integrate multi-omics data, further extending the dimensions of diagnosis and treatment. With multimodal

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https://doi.org/10.1016/j.intonc.2025.06.002

Available online 19 June 2025
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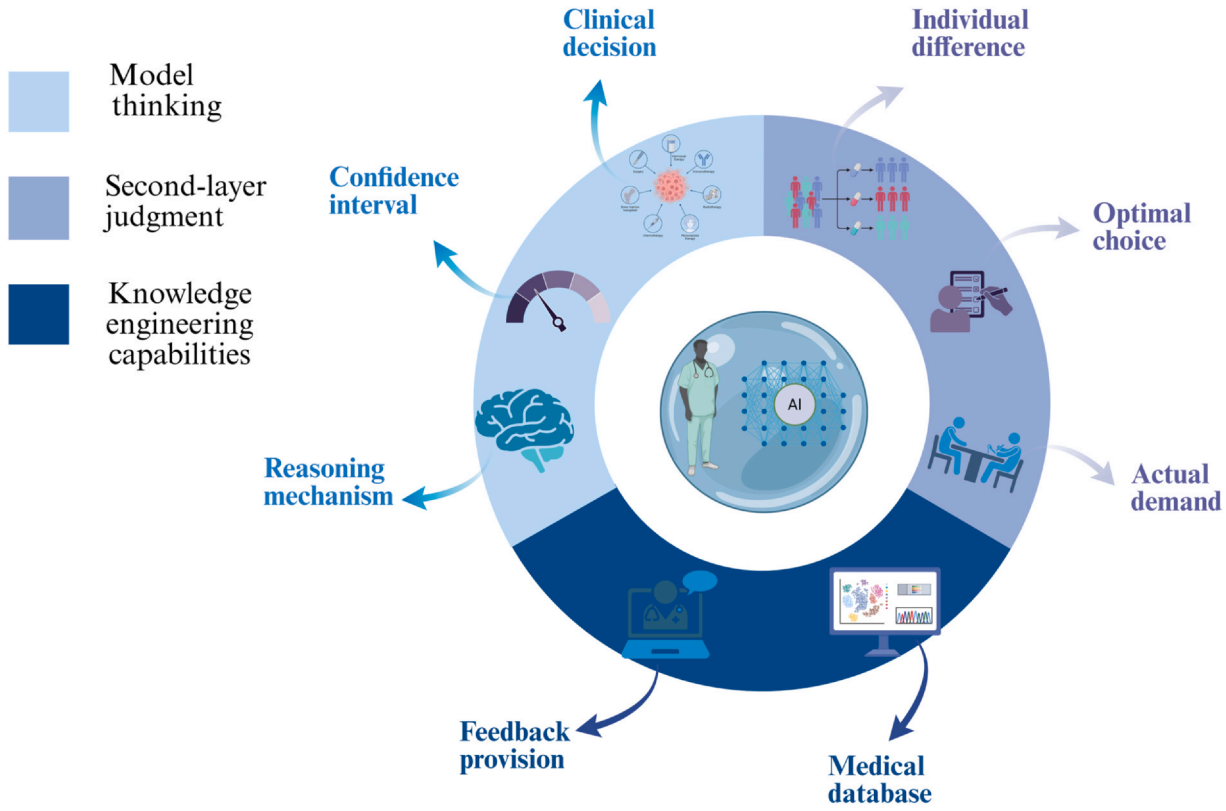


Figure 1. New requirements for oncologists.

data, oncologists' understanding of diseases will rapidly improve, leading to the optimization of individualized treatment plans.

New HCI models will also revolutionize treatment monitoring. Machine learning modeling enables continuous monitoring of patients' health signals,[8] assisting doctors in making timely adjustments to treatment plans and ultimately optimizing treatment outcomes.

These innovations in clinical decision-making paradigms require doctors to be proficient in interpreting digital models and to develop a virtual reality mapping mindset.

Revolution of doctor–patient relationships

Generative AI models not only assist doctors but also provide patients and their families with rapid access to medical knowledge, resulting in marked changes in traditional doctor–patient communication models. Natural language processing technology can automatically generate multiple versions of disease explanations and support intelligent doctor–patient communication systems. Virtual reality technology helps patients visually understand treatment processes.[9]

Consequently, doctors' roles will shift significantly—from being information transmitters to value integrators, and from focusing on treatment sessions to managing the life cycle of health.

Future oncologists' training should emphasize key capabilities that AI cannot replace, such as empathy, ethical judgment, and handling of medical emergencies under uncertainty.

Core competencies of future oncologists

With population aging and the continuous advancement of medical screening and detection technologies, the incidence of diagnosed malignant tumors is expected to rise steadily. Thus, future oncologists must develop core competencies in the following areas (Figure 2):

(1) HCI: To enable AI to accurately understand clinical problems and provide effective solutions, oncologists must master prompt engineering. Additionally, they should develop proficiency in using multimodal LLMs for cancer diagnosis. Since efficient HCIs rely on mutual trust between humans and machines, oncologists must clearly understand AI models' internal logic, while AI interpretability must be enhanced to earn doctors' trust;

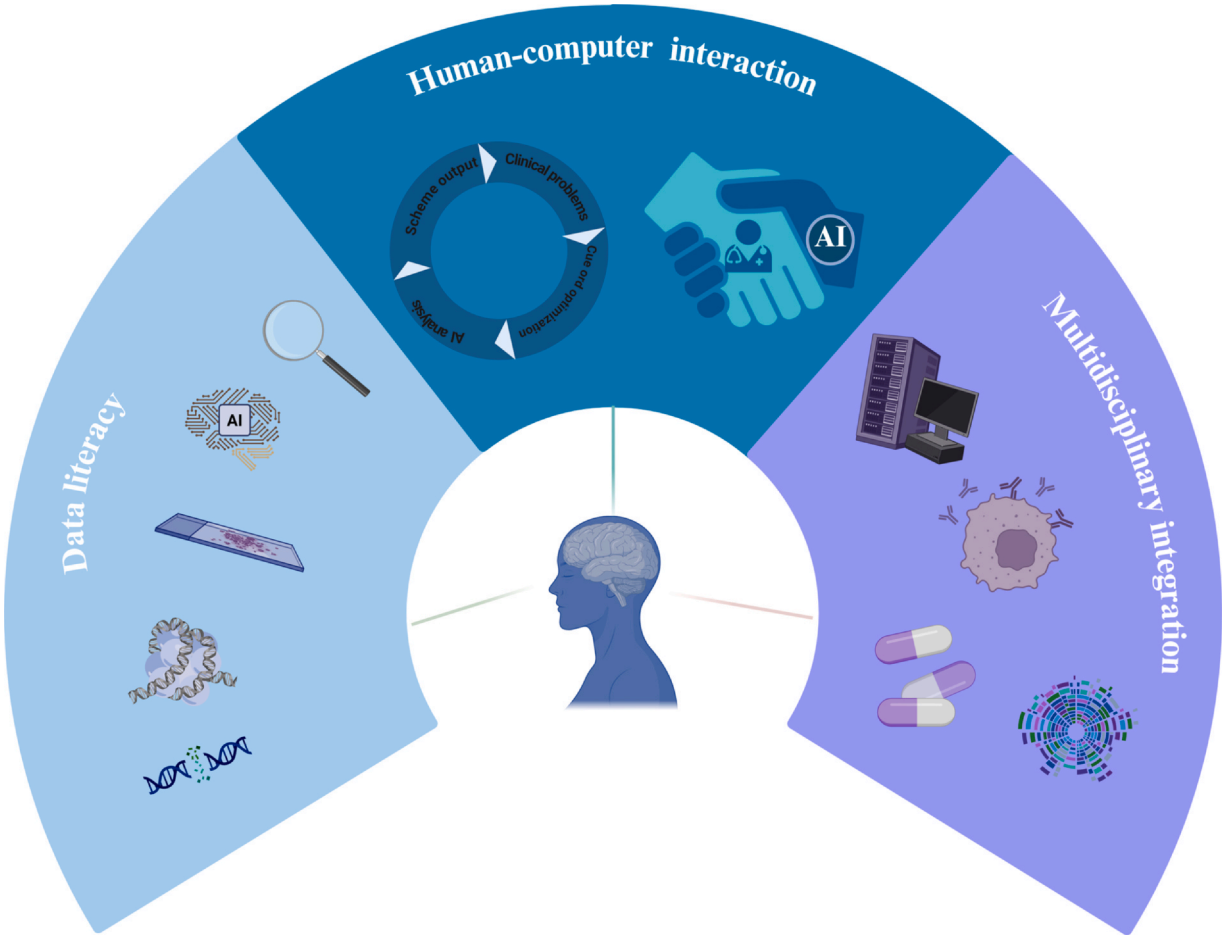


Figure 2. Core competencies of future oncologists.

(2) Data literacy: Oncologists must grasp the biological significance of multi-omics data and develop essential skills in algorithm auditing, data storytelling, and quality control;

(3) Multidisciplinary integration: Oncologists must embrace intelligent oncology—the integration of knowledge and cutting-edge technologies from basic biology, clinical oncology, engineering, information science, social sciences, and other disciplines to achieve comprehensive and precise tumor prevention, screening, diagnosis, treatment, and rehabilitation.

It should be noted that, whether in traditional or AI-era medicine, critical thinking is paramount. In the future, vigilance is essential against both the risk of clinical reasoning degradation due to over-reliance on AI-assisted tools and the potential biases embedded in data and algorithms.

No matter how advanced technology becomes, it cannot replace the clinical wisdom of doctors. Thus, future oncologists should be medical navigators who can skillfully use AI to move forward while holding the compass that guides the direction. The ultimate goal of this career path is not human–machine competition but fulfillment of the medical credo “to cure sometimes, to relieve often, and to comfort always.”

CRediT authorship contribution statement

Mengjiao Wei: Writing – original draft, Conceptualization. **Bin S. Teh:** Writing – review & editing, Conceptualization. **Bo Xu:** Writing – review & editing, Supervision, Conceptualization.

Declaration of Competing Interest

Bo Xu and Bin S. Teh are editorial board members for Intelligent Oncology and were not involved in the editorial review or the decision to publish this article. The authors declare no conflicts of interest.

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