

AI and human expertise in cancer care – striving for synergy

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Artificial intelligence (AI) excels at rapid data synthesis and pattern recognition, yet the practice of oncology demands nuanced clinical judgement, ethical reasoning and authentic empathy – qualities only humans can provide. The future of cancer care lies in synergy: AI augmenting human expertise, not replacing it. Excellence emerges when computational power meets clinical wisdom.

Artificial intelligence (AI) – including generative models such as [ChatGPT](#) – has rapidly permeated clinical practice, with public discourse often portraying these technologies as potential replacements for expert medical care. Although AI tools demonstrate impressive accuracy in standardized settings and can provide information upon immediate request, oncology practice poses complex challenges: patients with cancer require nuanced, patient-centred decision-making, multidisciplinary input and human-driven empathy throughout their care. The prevailing approach to integrating AI tools in oncology that is focused on test-driven performance comparisons and generic recommendation engines fails to meet these demands. Optimal cancer care must move beyond ‘good enough’ AI benchmarks that merely require acceptable accuracy, instead embracing a collaborative paradigm in which AI augments, rather than replaces, the expertise of oncology teams. Despite substantial literature describing AI performance metrics, empirical research on how AI and human clinicians can work together in practice and what real-world patient outcomes result from this partnership remains limited^{1,2}.

The polemic: ‘good enough’ is not enough

Large language models (LLMs) and generative systems such as ChatGPT offer general recommendations and rapid literature synthesis; however, they struggle with complex, individualized decisions that are fundamental to oncology. AI-generated treatment plans have shown high concordance with tumour-board decisions for routine clinical cases – often exceeding 90% agreement – but frequently fall short in rare, post-operative or intricate clinical scenarios³. These tests fail to recapitulate the multifaceted reasoning of human experts that is required for excellence in real-world cancer care, particularly with regard to creativity, ethical judgement and therapeutic timing^{4,5}. Moreover, current metrics for the assessment of AI tools fail to capture crucial components of care: patient empathy, creative problem-solving and optimal timing. As research paradigms shift, increasing emphasis should be placed on evaluating collaborative models with patient outcomes at their core⁶,

requiring rigorous trials comparing expert teams with versus without AI support^{3,7}.

The solution: a symbiotic AI–human paradigm

The future of AI in oncology lies in synergy – a partnership in which AI and human experts contribute distinct, complementary capabilities^{2,8} (Box 1). Strengths of AI include automatic, instant recall of broad medical knowledge, rapid literature synthesis and integrative analysis of multimodal clinical data (images, text and molecular profiles). Human clinicians excel in contextual arbitration, imaginative reasoning and authentic human connection^{4,7}. This complementarity manifests across multiple dimensions of oncology practice.

In knowledge recall, AI systems deliver automated, broad and instantaneous access to clinical guidelines, medical literature and evidence-based protocols, scanning thousands of studies in seconds. Clinicians bring deep, practiced and holistic understanding shaped by years of clinical experience, pattern recognition across diverse patient populations and a nuanced appreciation of how evidence translates to individual cases. These human attributes ensure that AI’s encyclopaedic retrieval augments rather than replaces the seasoned judgement physicians develop through sustained practice^{2,8}.

For multimodal reasoning, AI integrates disparate data streams, such as radiological images, pathology slides, genomic sequences and clinical notes, and can identify patterns imperceptible to humans^{3,8}. Physicians interpret these findings within the unique context of each patient, weighing comorbidities, social determinants, treatment tolerance and preferences to personalize decisions¹.

Human experts drive innovation based on imaginative reasoning and lived clinical experiences, generating creative solutions and formulating research questions beyond current knowledge. Additionally, although AI can generate empathetic language through natural language processing, only human clinicians build sustained, authentic therapeutic relationships rooted in a genuine emotional connection that foster trust, improve treatment adherence and create the psychological safety necessary for excellence in cancer care^{3,9}.

Finally, AI can automate routine, time-consuming workflow tasks including documentation, data entry, preliminary image analysis and literature summarization. This automation liberates clinicians to focus cognitive and other resources on complex diagnostic reasoning, innovative problem-solving, interdisciplinary collaboration and meaningful patient relationship-building that defines high-quality oncology care^{1,7}.

Novel frameworks propose cognitive augmentation models whereby AI acts as pattern finder and synthesizer, while clinicians arbitrate context and provide emotional depth^{3,5}. For example, collaborative decision-making can leverage LLMs to generate evidence-based options, which are then refined by expert teams for individualized plans. Bidirectional learning (‘human-in-the-loop’) ensures that AI systems continuously improve through physician feedback^{1,10}.

Box 1 | Key principles for effective AI–human collaboration in cancer care

Artificial intelligence (AI) tools provide instant access to guidelines, summaries and annotations of clinical literature, and can synthesize multimodal data and automate routine clinical tasks.

- Human experts offer contextual judgement, creative problem-solving and authentic empathy.
- Optimal care results when AI augments — not replaces — human decision-makers.
- Multidisciplinary team integration and bidirectional feedback ensure the safety and robust performance of AI tools.
- Improvements in patient-centred outcomes, not mere diagnostic accuracy, should drive the adoption of AI tools.

Team-based AI implementation and measures of excellence

Achieving this synergy requires multidisciplinary teams and thoughtfully deployed AI systems working in concert. AI supports literature synthesis, workflow automation and multimodal data integration but cannot replace the creative problem-solving and deep collaboration inherent in human teamwork^{3,6}. The improved patient outcomes achieved at high-volume versus low-volume centres demonstrate that collegial decision-making results in better care, emphasizing the value of human expertise and team-based approaches³.

Practical implementation demands AI systems be used as tools — to triage, streamline routines and synthesize clinical guidance — always under the arbitration of experienced clinicians¹. Clinical examples, such as AI-assisted radiology, demonstrate that automation can free experts from routine tasks and thus increase their focus on nuanced judgement and patient engagement^{4,6}. To maximize benefit, AI must empower, not supplant, collaborative care.

Measuring excellence in this new era requires more than diagnostic accuracy. Essential requirements for comprehensive care include empathy, trust, creativity and operational efficiency, not just benchmark performance scores^{9,10}. Future research should rigorously compare hybrid human–AI care teams with traditional practice, utilizing both quantitative and qualitative frameworks^{5,7}. Safety and equity will depend on continuous, bidirectional feedback between technology and clinicians^{1,6,9} (Box 1).

Call to action

When lives are at stake, settled standards are unacceptable. Paradigms for the implementation of AI in healthcare systems must shift from competitive, replacement narratives to models of synergy and co-creation^{1,5}. To realize this vision, three crucial steps are required:

First, clinical trials must rigorously compare patient outcomes achieved using collaborative AI–human models versus traditional approaches^{3,7,10}. Randomized designs should evaluate human-only workflows against AI-assisted paradigms and AI-alone systems, identifying which contexts benefit most from synergy and establishing evidence-based collaboration protocols.

Second, assessment frameworks must capture the full spectrum of care, including diagnostic accuracy, empathetic communication, teamwork and creative problem-solving, besides relying solely on simple

quantitative metrics. Evaluations should incorporate patient-reported outcomes, measures of care continuity, clinician satisfaction and creative solutions for complex cases.

Third, healthcare systems must leverage multimodal AI and clinical teams in concert to achieve synergy and thus next-generation excellence^{1,6}. This integration requires combining multimodal AI inputs, such as images, genomics data and clinical notes, to generate outputs for nuanced interpretation by clinicians and refinement through ongoing dialogue, positioning AI as an intelligent partner that handles data synthesis while preserving irreplaceable human capacities for judgement, ethical reasoning and compassionate care.

Conclusions

Cancer care is not reducible to simple protocols or ‘recipes’, nor can technology alone substitute for the care and ingenuity of expert providers. The future of oncology should be built on symbiosis, not rivalry: a blended model whereby the computational power of AI amplifies human creativity, empathy and expertise. By adopting this uniquely collaborative paradigm and elevating our standards beyond ‘good enough’, we can deliver extraordinary care to every patient.

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Competing interests

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