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Emerging artificial intelligence advances in oncology: latest updates from the 2026 AACR annual meeting

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Abstract

Advances presented at the 2026 American Association for Cancer Research (AACR) Annual Meeting highlight a shift from standalone artificial intelligence (AI) models to integrated, agentic systems across oncology. Platforms such as Synapse enable large-scale data coordination, supporting interoperable and reproducible research. Building on this foundation, conversational and multi-agent AI tools (e.g., DrBioRight, GP CoPilot, Isabl AI Agent) allow natural language interaction with multimodal cancer data, lowering technical barriers. Agentic frameworks for real-world data (RWD) transformation, including clinical document abstraction, cohort extraction, and social determinants of health (SDOH) analysis, demonstrate high accuracy and scalability, while self-critical systems improve reliability. Clinically, AI shows growing impact through validated imaging biomarkers, enhanced trial matching, and scalable cohort identification. In parallel, multi-agent systems are accelerating therapeutic discovery, including CAR-T development and immunotherapy target identification. Collectively, these advances position AI as an active, collaborative partner in cancer research and precision oncology.

Keywords Artificial intelligence (AI), AACR 2026, Cancer, Agentic systems, Precision oncology, Real-world data (RWD), Immunotherapy

To the editor

AACR 2026 highlighted a decisive shift from isolated AI models toward integrated, agentic ecosystems that span data infrastructure, analysis, and clinical translation. Across diverse applications, a unifying theme emerged: AI is evolving from a passive analytical tool into an active collaborator in oncology research and care.

AI infrastructure and agentic systems for cancer research

A foundational requirement for scalable AI in oncology is robust, interoperable data infrastructure capable of integrating heterogeneous datasets across institutions and modalities (Table 1). Platforms such as Synapse exemplify this paradigm by enabling large-scale, multi-institutional data coordination, supporting petabyte-scale datasets,

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Table 1 AI infrastructure and agentic platforms in cancer research

Platform	Core function	Key features	Impact	Reference
Synapse	Data coordination	Metadata, provenance, APIs	Enables large-scale collaboration	[1]
DrBioRight	Conversational omics analysis	LLM interface, multi-omics support	Democratizes analytics	[2]
GP CoPilot	Workflow automation	GenePattern integration, reproducibility	Accelerates bioinformatics workflows	[3]
Isabl AI Agent	Genomics pipeline interaction	MCP, RAG, tool orchestration	Simplifies multimodal data access	[4]
SDOH extraction system	Health equity data extraction	Temporal reasoning agents	Enables disparities research	[5]
Cohort extraction agent	Trial feasibility	Adaptive reasoning, code execution	Supports large-scale cohort identification	[6]
AI-CDA workflow	Clinical data abstraction	Multi-agent NLP + LLM	High-fidelity structured RWD	[7]
Charles	Drug discovery analyst	Self-critical validation	Improves AI reliability	[8]

standardized metadata schemas, provenance tracking, and fine-grained access control [1]. These features ensure reproducibility and facilitate collaboration across geographically distributed research communities. By lowering technical and logistical barriers to data sharing, such infrastructures provide the essential substrate upon which advanced AI models and analytical pipelines can be developed and deployed.

Building on this foundation, studies have introduced agentic AI frameworks that fundamentally transform how researchers interact with complex cancer data. Conversational platforms, including DrBioRight [2], GP CoPilot [3], and the Isabl AI Agent [4], allow users to query datasets, design analytical workflows, and execute computational tasks through natural language interfaces. These systems integrate retrieval-augmented generation (RAG), standardized communication protocols such as the Model Context Protocol (MCP), and dynamic workflow orchestration to enable seamless interaction with multimodal genomics and clinical data. By abstracting technical complexity, they democratize access to advanced bioinformatics and accelerate hypothesis generation.

A consistent and important advance is the emergence of multi-agent architectures, in which specialized agents collaborate to perform discrete tasks such

as data retrieval, reasoning, validation, and execution. This distributed intelligence model improves robustness and scalability compared to monolithic systems. In the context of real-world data (RWD), agentic systems have demonstrated the ability to automate complex processes including cohort extraction, clinical document abstraction, and temporally aware extraction of social determinants of health (SDOH) [5–7]. These approaches were reported to achieve strong task-specific performance while reducing manual effort and enabling structured, longitudinal patient representations.

Importantly, reliability and trustworthiness have become central considerations. Self-critical frameworks such as Charles address the challenge of large language model hallucination by incorporating adversarial validation, constrained data environments, and iterative fact-checking mechanisms [8]. Such designs are intended to improve grounding in verifiable data and may enhance confidence in AI-assisted decision-making. Collectively, these advances signal a transition toward autonomous, interpretable, and reproducible AI systems that not only analyze data but actively participate in the orchestration of cancer research workflows at scale.

Clinical translation and therapeutic innovation

AI applications presented at AACR suggested increasing maturity in clinical translation, reflecting ongoing efforts to move beyond proof-of-concept development toward tools with potential clinical utility (Table 2). In imaging, PanClaudinAI prospectively validated a deep learning model for the non-invasive prediction of CLDN18.2 expression in pancreatic cancer using contrast-enhanced CT [9]. By enabling rapid biomarker assessment without the need for invasive biopsy, such approaches may facilitate patient selection for targeted therapies and improve clinical workflow efficiency.

In clinical operations, agentic retrieval systems significantly advanced trial eligibility matching by improving the synthesis of dispersed evidence from unstructured clinical notes [5, 7, 10]. Compared with conventional retrieval-based approaches, these systems were reported to achieve improved accuracy and recall, particularly in complex, multi-criterion eligibility scenarios. In parallel, automated cohort identification and RWD abstraction platforms leveraged adaptive, multi-agent architectures to extract structured insights from heterogeneous datasets at scale [6]. These tools support clinical trial feasibility assessments, regulatory-grade real-world evidence generation, and more efficient study design.

AI is also increasingly influencing therapeutic discovery. Multi-agent systems for CAR-T development integrate antigen selection, toxicity prediction, and molecular design into coordinated pipelines, reducing development timelines and potential failure rates [11]. Similarly,

Table 2 Clinical and translational AI applications

Application	Domain	Cohort/scale	Reported findings	Clinical implication	Reference
PanClaudinAI	Imaging biomarker	Multicenter (<i>n</i> > 1,000)	AUROC 0.78–0.85	Non-invasive patient selection	[9]
Trial matching (agentic retrieval)	Clinical NLP	618 queries	Accuracy + 6–13%	Improved trial enrollment	[10]
Cohort extraction (RWD)	Data science	> 550 K patients	High task completion	Scalable feasibility analysis	[6]
AI-CDA	Clinical abstraction	~ 1,500 patients	F1-score up to 0.94	Structured RWE generation	[7]
SDOH extraction	Health equity	Large document sets	High reported extraction confidence	Better patient stratification	[5]
CAR-T multi-agent system	Therapeutics	Preclinical	End-to-end automation	Faster drug development	[11]
ImmunoVerse-Chat	Target discovery	Pan-cancer atlas	Integrated antigen insights	Next-generation immuno-therapy design	[12]

Quantitative metrics are reported as presented in the corresponding AACR 2026 abstracts. These metrics reflect different tasks, datasets, endpoints, and validation settings and should not be interpreted as directly comparable measures of performance across studies. Because only abstract-level information was available, detailed assessment of validation methodology and external generalizability was not possible

platforms such as ImmunoVerse-Chat enable interactive, pan-cancer antigen discovery by combining immunogenic data with reasoning-driven interfaces, potentially enabling more efficient prioritization of candidate therapeutic targets for further investigation [12].

These advances illustrate how AI is bridging the gap between large-scale data generation and actionable clinical and therapeutic insights. Successful deployment of agentic AI systems in oncology will require careful attention to broader challenges, including algorithmic bias, population representativeness, privacy protection, governance of multi-institutional data resources, and appropriate human oversight.

Abbreviations

AACR	American association for cancer research
AI	Artificial intelligence
API	Application programming interface
AUROC	Area under the receiver operating characteristic curve
CAR-T	Chimeric antigen receptor T-cell
CT	Computed tomography
CLDN18.2	Claudin 18.2
F1-score	Harmonic mean of precision and recall
LLM	Large language model
MCP	Model context protocol
NLP	Natural language processing
RAG	Retrieval-augmented generation
RWD	Real-world data
RWE	Real-world evidence
SDOH	Social determinants of health

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We acknowledge that the AACR 2026 Annual Meeting featured a large number of high-quality abstracts spanning diverse areas of artificial intelligence in oncology. Due to space limitations, we selected 12 representative studies that reflect key emerging themes; however, many other noteworthy contributions could not be included, and we regret these omissions. Additionally, our analysis is based solely on information available in the published abstracts. While these provide valuable insights, a comprehensive understanding of each study would require full access to the complete manuscripts and associated data. This article was intended as a thematic meeting summary rather than a systematic review, and therefore does not represent an exhaustive assessment of all AI-related presentations.

Author contributions

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Data availability

No datasets were generated or analysed during the current study.

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Consent for publication

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Competing interests

The authors declare no competing interests.

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