Thematic investing series

Positioning portfolios for long-term transformational change

July 2026

AI-driven precision medicine

Where healthcare becomes more personalised, predictive and data-driven

What is precision medicine?

- Precision medicine aims to tailor prevention, diagnosis and treatment to the characteristics of each patient.
- Traditional medicine often treats patients based on broad averages.
- Precision medicine uses patient-specific information, such as genes, biomarkers, imaging and clinical history.
- AI can help analyse these complex datasets faster and more consistently.
- The aim is not just to treat disease, but to understand which treatment is most likely to work for which patient.

Traditional vs. precision medicine
A shift from averages to individuals

Traditional medicine	Precision medicine
Asks: "What usually works for this disease?" Treatment is based on studies of groups of patients with the same condition.	**Asks:** "What is most likely to work for this patient?" Treatment is tailored to the individual based on their unique characteristics.
One-size-fits-most-approach	**Right treatment, right patient**
Standard treatment for the average patient	Personalised treatment for the individual
Based on population averages from clinical trials	Based on genetic, clinical, lifestyle and environmental data
May work well for some, less well (or not at all) for others	Greater chance of effectiveness and better outcomes
Higher chance of side effects or ineffective treatment	Fewer side effects and more efficient care

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Why AI matters in precision medicine

AI is useful because precision medicine depends on linking many different data types.

- **Genomics:** identifies mutations and inherited risk.
- **Pathology:** analyses tissue and tumour characteristics.
- **Imaging:** detects disease patterns and treatment response.
- **Biomarkers:** helps predict which therapy may work.
- **Clinical records:** adds medical history, treatment patterns and outcomes.

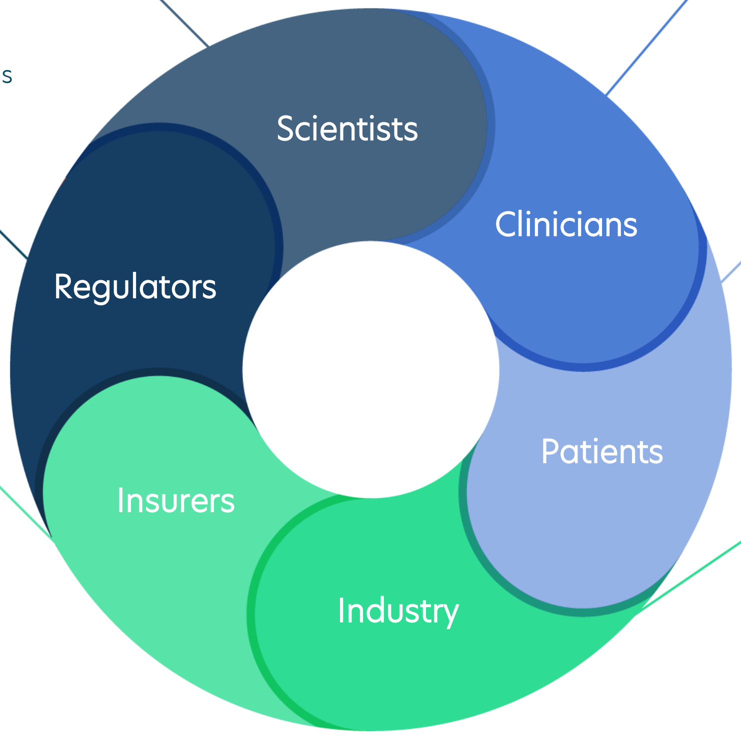
AI can combine these signals into risk scores, treatment recommendations or trial-matching tools. Reviews in precision oncology highlight the role of AI and multi-omics integration in biomarker discovery, disease understanding and treatment selection.

Collaboration among key stakeholder groups for AI-driven patient benefit

- Develop AI models
- Train clinicians
- Educate patients
- Facilitate prospective studies and clinical trials

- Adapt AI-related regulatory framework
- Publish more clinical validation data

- Facilitate AI-related insurance coverage
- Quantify AI-driven patient benefit



- Clarify the true unmet clinical need
- Learn AI models
- Use and evaluate AI models
- Provide feedback to developers and regulatory agency
- Lead clinical trials

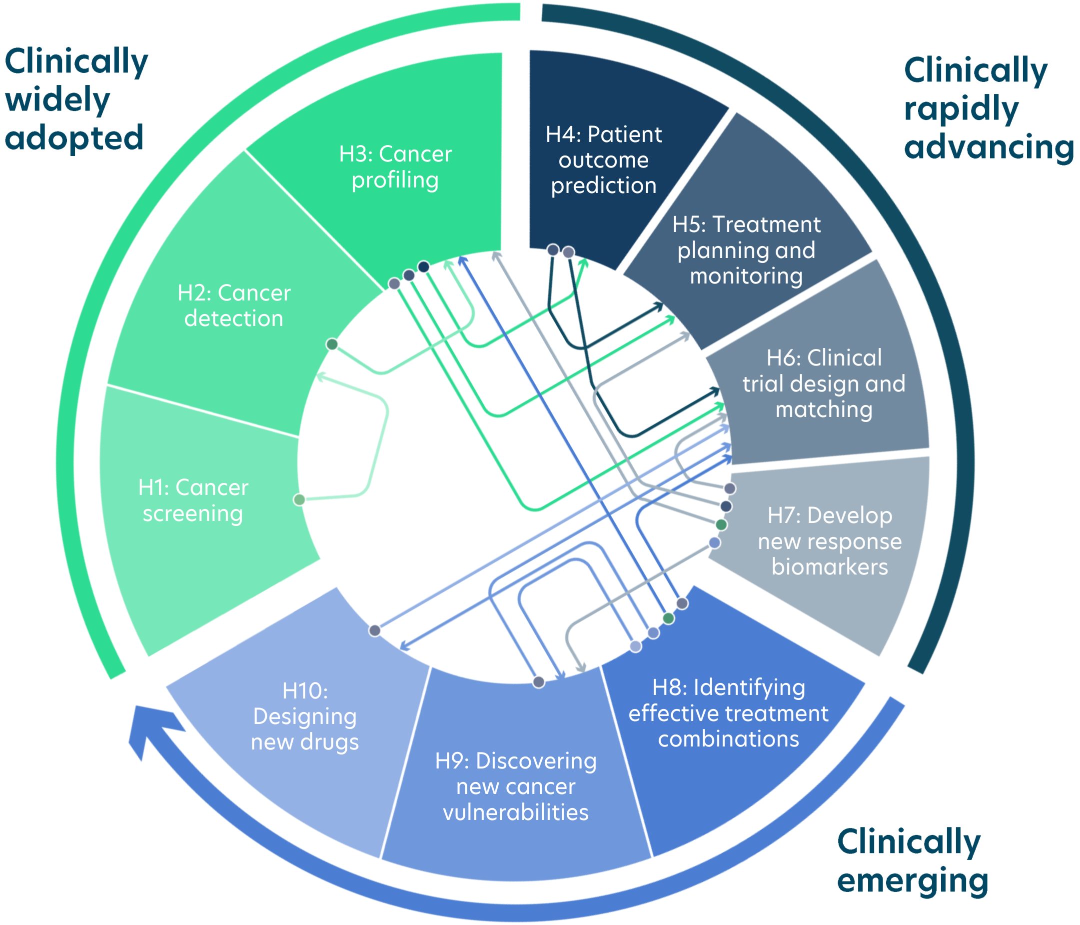
- Understand AI models
- Participate in clinical trials
- Disseminate AI advancements
- Consent to data collection and sharing

- Develop AI models
- Refine prototype AI models
- Design AI-based new drugs

Source: Chang, T.-G., Park, S., Schäffer, A.A., Jiang, P. & Ruppin, E. Hallmarks of artificial intelligence contributions to precision oncology. Nature Cancer (2025)

Oncology is one of the clearest early use cases for AI-driven precision medicine

- Cancer is highly heterogeneous, which means patients with the same cancer type can respond differently to treatment.
- Precision oncology already uses biomarkers and genomic profiling to guide therapy selection.
- AI can help integrate tumour genomics, imaging, pathology and clinical data.
- Potential use cases include earlier detection, recurrence prediction, treatment selection and trial matching.
- Reviews of AI in precision oncology highlight applications across prevention, diagnosis, biomarker discovery, treatment optimisation and monitoring.



Source: Chang, T.-G., Park, S., Schaffer, A.A., Jiang, P. & Ruppin, E. Hallmarks of artificial intelligence contributions to precision oncology. Nature Cancer (2025)

Pharma is using AI to improve drug development

- AI has the potential to shorten drug development timelines in an optimistic scenario. Also with more efficient processes, cost per approved drug is estimated to come down significantly in an ideal AI-powered drug discovery world.
- However, clinical trials remain the primary bottleneck, with timelines anchored by human biology, patient variability, and regulatory requirements.
- As a result, most benefits today are concentrated in early discovery, with limited proven impact on late-stage clinical outcomes.
- Overall, AI is improving efficiency at the front-end, but full pipeline disruption depends on clinical validation and advances in biology.

Current pathway (today)

Total timeline: 10 – 15 years | Cost per approved drug: ~$1 – $2.5B | Overall success rate: ~5 – 10%

1. Target discovery and validation	Biology research, omics, hypothesis generation, wet lab validation	2 - 4 Years
2. Hit discovery	Screen millions of compounds (HTS) to find initial hits	1 - 2 Years
3. Lead optimisation	Iterative chemistry cycles to improve efficacy, safety, PK/PD	2 - 4 Years
4. Preclinical development	In vitro + animal studies, ADME, toxicology, manufacturing	1 - 2 Years
5. Clinical trials (Ph i - iii)	Recruitment, trial execution, monitoring, data analysis	5 - 7 Years
6. Regulatory review and approval	Regulatory submission, review, and approval	1 - 2 Years

10 - 15 Years
(Current pathway)

Ideal AI-powered pathway (end-state vision)

Total timeline: 5 – 8 years | Cost per approved drug: ~$0.5 – $1.2B | Overall success rate: ~ 15 – 30%

1. AI-powered target discovery & validation	Multi-omics + causal AI models, digital twins, in silico validation	3 - 6 Months
2. AI-generated hit discovery	Generative AI designs novel molecules de novo; rapid in silico screening	Weeks
3. AI-driven lead optimisation	Multi-objective AI optimisation (potency, safety, PK/PD) with closed-loop learning	6 - 12 Months
4. AI-enhanced preclinical	*In silico* ADME/Tox predictions, fewer animal studies, faster iteration	6 - 12 Months
5. AI-optimised clinical trials (Ph i - iii)	AI-driven patient stratification, adaptive designs, real-time analytics	3 - 5 Years
6. AI-assisted regulatory	Continuous evidence generation, submission acceleration	6 - 12 Months

5 - 8 Years
(Optimistic "blue sky" scenario)

Sources: BIO, Informa Pharma Intelligence, IQVIA, Tufts CSDD, peer-reviewed studies (2015-2026), company disclosures (Insilico, Exscientia), and industry reports. Assumptions: AI pathway reflects forward-looking estimates; early-stage acceleration supported by case studies, while end-to-end timelines remain constrained by clinical and regulatory requirements. Success rate improvements are primarily driven by better target selection, not guaranteed clinical outcomes. Estimates reflect best-case integration of AI across the full drug discovery stack

Continue the AI-Driven Precision Medicine Conversation

AI is accelerating the shift towards more personalised healthcare. The full publication explores where value may emerge across the healthcare value chain, key growth drivers, and the risks investors should monitor.

Be selective

The theme is becoming more investible, but adoption is likely to develop in stages.

Look beyond drug discovery

Opportunities may emerge across different venues.

Manage the risks

Regulatory hurdles, clinical validation and data privacy remain key constraints.

In the full publication

- Maturity framework and timing assessment
- Value-chain opportunity map
- Bull, base and bear scenario analysis
- Key risks across regulatory, clinical and commercialisation risks
- Portfolio implementation considerations

Speak to your client advisor for the full AI-Driven Precision Medicine thematic publication

Learn More

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