Market overview

The AI revolution in clinical trials

Trends and strategies for drug developers

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Introduction

Quick and confident decision-making in clinical trial strategy and execution is imperative to minimizing drug development timelines and maximizing market advantage. Rising costs, evolving and regionally diverse regulatory guidance, and more complex trial requirements introduce challenges to trial design and create hurdles that often delay development. This market summary reveals insights into ways that artificial intelligence (AI)-driven clinical trials help maximize drug development efficiency and minimize delivery times.

In 2024, 45% of survey respondents reported their **clinical trials have grown longer** over the past two years.

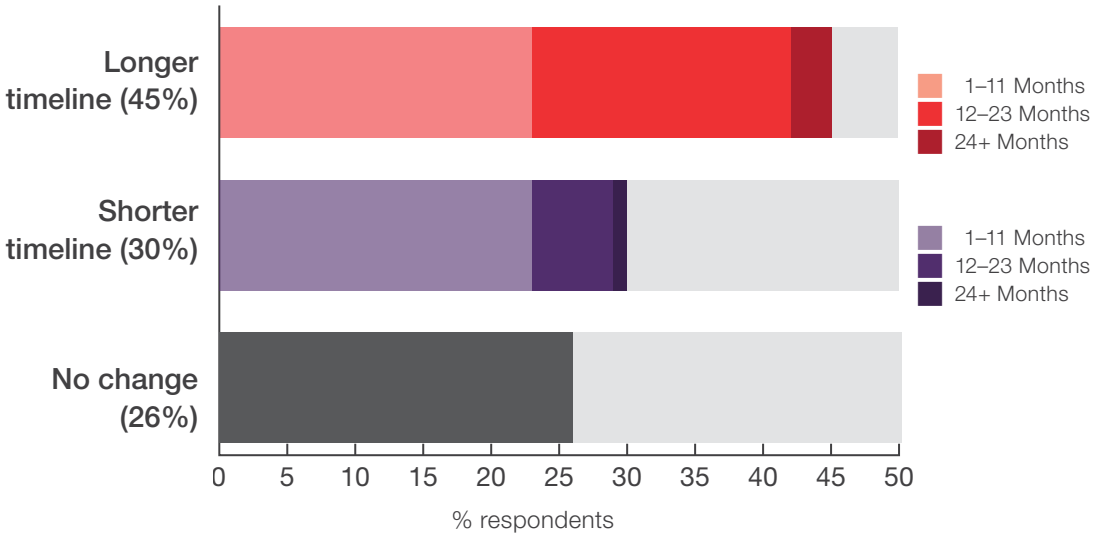

Figure 1. Percent of pharmaceutical companies that report longer, shorter, or no change in clinical trial lengths according to 150 stakeholders surveyed by Thermo Fisher Scientific. 3% of respondents indicated they did not know or this question was not applicable. (Note: Values add to 101% due to rounding.)[1]

AI is transforming global health care markets

US$ 30 trillion total global health care market

US$ 868 billion potential AI contribution to health care market

2030 Forecast

AI is not new to health care

Some aspects of personalized therapy development, drug discovery, and clinical trial design are already leveraging the power of AI. A recent study by Strategy& (part of the PricewaterhouseCoopers network), reports adoption of AI applications in health care is expected to increase more than two-fold from 2025 (approximately 15%) to 2030 (more than 30%) (Figure 2). AI-enabled cost savings are projected to contribute almost 75% (US$ 646 billion) to total health care market growth —approximately three-fold more than growth projected from revenue gains (25%, US$ 222 billion) (Figure 3).[2] A study conducted by Thermo Fisher Scientific reveals that, in 2024, biopharmaceutical companies included AI among their top five technology pursuits (Figure 4).[1] If realized, in 2030 this growth in global AI usage in health care would contribute an estimated US$ 868 billion to a total global health care market of nearly US$ 30 trillion.[2]

AI-enabled cost savings are projected to contribute close to 75% to total market health care growth.

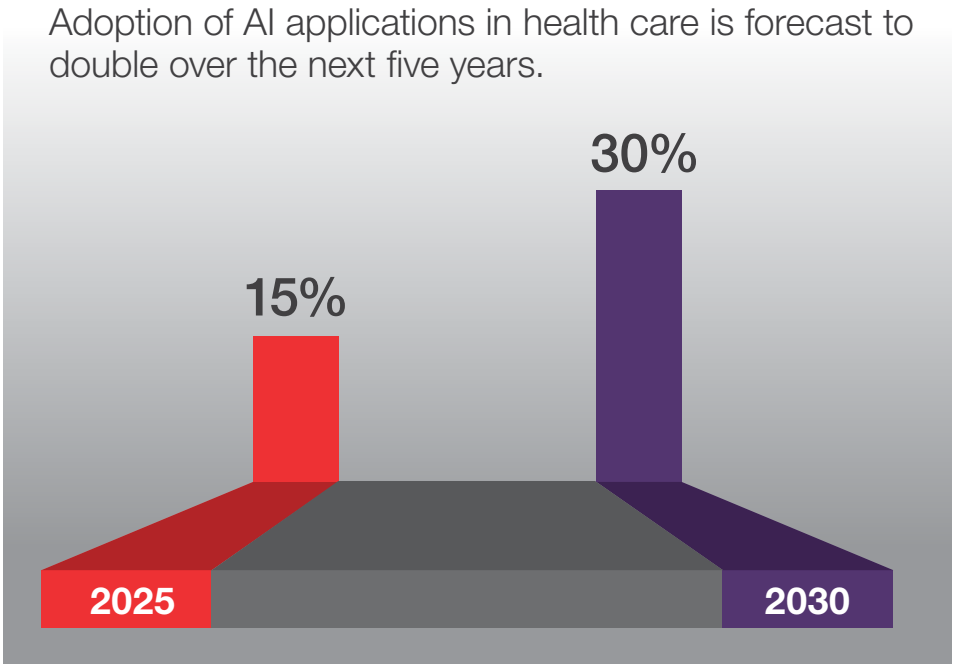

Figure 2. Contribution of AI adoption to health care market in 2025 and projected for 2030.[2]

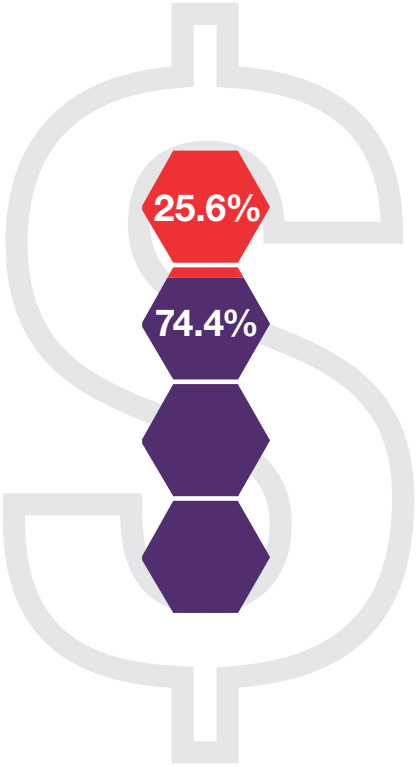

Figure 3. Comparison of cost savings vs. revenue in contribution of AI to 2030 forecast health care market.[2]

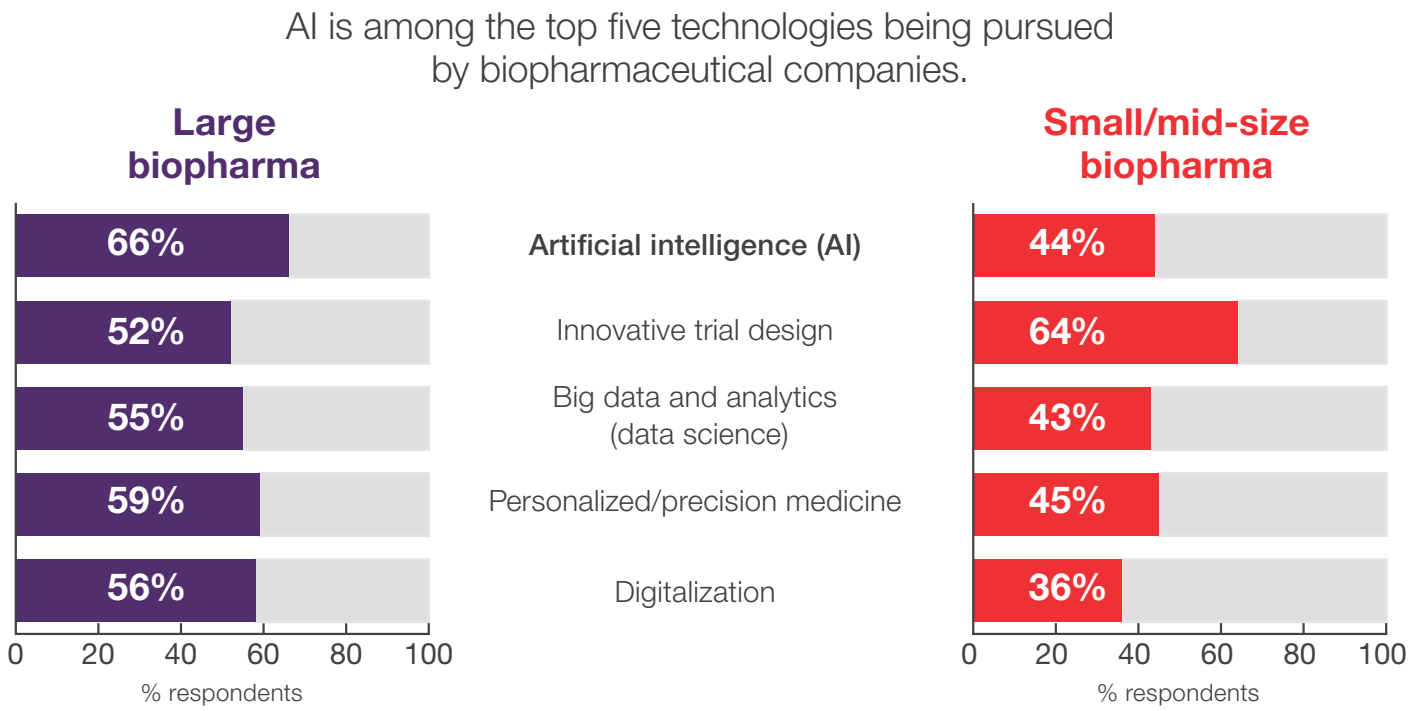

Figure 4. 2024 technology priorities for 150 biopharmaceutical companies surveyed by Thermo Fisher Scientific.[1]

Trends in AI contributions to clinical trial strategies

Increasing life expectancy, new treatment paradigms for complex and rare diseases and preventive care, and biotechnology innovations are driving demand for new pharmaceutical products. However, commercial release of potentially life-saving medicines are often hindered by delays in data availability, analysis, regulatory information, or other factors that complicate timely decision-making during trials. The power of AI offers potential to drive efficiency and accuracy through all phases of a clinical trial in multiple ways.[2,3,4]

Maximize trial design efficiency

Adaptive clinical trial designs enable investigators to make decisions in real time as new data is revealed. However, building robust adaptive clinical trials based on traditional statistical and methodological models is highly complex. AI helps cut through this complexity by enabling better prediction of factors such as participant compliance, drug activity, milestones, and outcomes to help reduce trial scope, cost, and timelines.[5]

Streamline enrollment and participant compliance

With advanced data analytics, machine learning algorithms, and natural language processing, AI technologies synthesize vast data within insurance claims, health records, and global registries. Such in-depth data is used to quickly build participant cohorts that reflect the population that will ultimately use the medication, improve recruitment strategies, and increase engagement and retention, particularly for rare diseases.[3,4,6]

AI systems that leverage baseline characteristics have already been used to predict individual participant outcomes.[3] For example, one automated clinical trial eligibility screener (AI-driven system that analyzes patient health records against trial criteria) yielded significant improvements in recruitment compared to standard recruiting practices (Figure 5).[7]

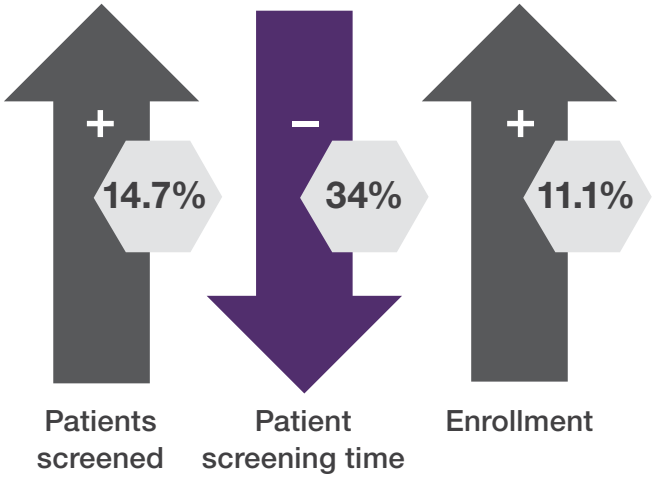

Figure 5. Improvements in trial participant recruitment enabled by an automated clinical trial eligibility screener.[7]

Pinpoint site selection

Identification of disease hotspots, site experience, concurrent trials, and patient convenience assessments allow sponsors to reach patients who might otherwise not have been able to participate. If sites become dormant, rapid notification and prediction of mitigating actions helps keep trials advancing efficiently.[3,4]

Enable real-time decision-making and adaptation

Armed with real-time results provided by AI and adaptive trial designs, investigators can predict and respond quickly to unexpected challenges such as adverse drug effects, patient non-compliance, or protocol deviations.[2,3,4]

Models using AI predict fruitful trial sites, **accelerating recruitment by 15-20%**.[4]

Challenges for AI adoption in health care

Multiple critical challenges hinder the full realization of AI's potential in health care

Fragmented regulatory landscapes

Global regulatory guidance governing the use of AI for cohort composition, multi-site trials, clinical practice guidelines, collaboration standards, and biospecimen data is highly variable. For example, the United States Food & Drug Administration (FDA),[8] some individual US states,[9] the European Union Artificial Intelligence Act (EUAIA),[10] the European Parliament General Data Protection Regulation (GDPR),[11] and several countries in the Asia Pacific region[2] each provide different guidance regarding monitoring, risk, participant rights, and data usage for the use of AI in clinical trials. However, developing region-specific strategies for greater global participation significantly increases trial cost and complexity.[2,6,12]

Shortage of digital knowledge

Using AI in clinical trial analytics has the potential to drive as much as 30% efficiency gains.[13] However, recent reports suggest there is a shortage of health care professionals who have the digital skills, particularly in AI, to realize those gains.[2]

Among the 114 health care professionals surveyed, **43% believe they lack the specialized skills** needed to advance digital progress in health care.[14]

Inconsistent access to data

Managing and analyzing massive amounts of data that rely on patient reporting, regional availability, standardization, and data quality introduces bias, difficulties accessing the data, and concerns about the reliability of AI-driven results.[2]

Evolving technology

The health care sector and pharmaceutical industry have strict requirements for cybersecurity, compliance, and confidentiality in technology-derived outcomes. Some AI solutions lack fundamental properties that allow for required verification, validation, or documentation.[2]

Consumer skepticism

Acceptance of AI-generated health care information varies globally depending on factors such as current use of other digital technologies and privacy concerns.[2] These societal concerns are reflected in skepticism of automated data collection and recommendations that limit adoption of AI methodologies and inhibit patient recruitment and compliance.

Health care player adoption

Acceptance of AI technologies within pharmaceutical companies is fundamental to realize the potential of AI technologies in clinical trials. However, pharmaceutical sponsors may be reluctant to apply new technologies to their highly specialized or established workflows.[2]

Drivers of growth in AI use in clinical trials

Proven reduced development timelines

AI tools that help optimize trial design, site selection, and forecasting have demonstrated reduction in trial delivery, trial delivery timelines, potentially enabling 25% faster protocol approval and 30-50% fewer amendments.[3,13]

Reduced costs and fast adaptation

With drug development costs averaging billions of dollars and many trials failing late in the process, AI-based adaptive trial designs that enable real-time decision making are providing valuable strategies to enhance success rates and reduce costs across all trial phases.[2]

Speed-to-market imperative

In the ongoing race to shorten drug development timelines and advance competitive position, innovative trial strategies are enabling drugmakers to move more swiftly from molecular design to regulatory submission.[6]

Regulatory evolution

Regulatory agencies worldwide are creating frameworks to evaluate AI-based products to enable more agile, inclusive, and innovative clinical trials.[2,3]

Research partnerships

Some pharmaceutical companies are increasing investment in partnerships with CROs and other technology providers to enhance their own research capabilities.

In tests conducted across 400 clinical studies, the AI algorithms that drive the **Clinical Trial Forecasting Suite by Thermo Fisher Scientific yielded an average time savings of 12 weeks** compared to traditional timeline management and forecasting processes.*

*Thermo Fisher Scientific internal data

AI-driven clinical trial strategies for the future

Currently, only 15% of global pharmaceutical and life science organizations feel fully prepared to develop AI business models. Many lack detailed strategies, struggle with consistency or scaling, or lack sufficient expertise to implement commercial applications.[2] Rethinking business models for evolving AI-savvy customer interests and regional needs is key to maximizing efficiency, accelerating trial conclusion, advancing competitive position, and generating market growth.[2]

- **Establish regional AI governance** to enable flexible trial strategies, standardize data management, ensure regulatory compliance, and reflect local market dynamics.[2]
- **Be prepared to pivot** with integrated AI algorithms that continually evolve with real-time trial data.[2]
- **Partner for maximum trial efficiency** to leverage expertise and advanced AI solutions for innovative, adaptive trial designs. Working with a CRO, such as the PPD clinical research business of Thermo Fisher Scientific, that offers comprehensive AI-driven trial planning and execution helps simplify interactions, contracting, budgeting, site initiation, and support in ongoing trial monitoring and continual adaptation and refinement.

Conclusion

The rapid evolution of AI capabilities and advancements in understanding disease present a unique opportunity for clinical trial networks to fundamentally reshape drug development with higher success rates and shorter timelines.

AI-driven Drug Development Digital Solutions by Thermo Fisher Scientific

Your innovative partner in optimizing drug development and clinical research

Digital products

Clinical Decision Suite
Enables real-time insights integrating milestone monitoring, risk prediction, material management, and tracking

Clinical Trial Forecasting Suite
Deep learning models and proprietary data enhance forecasting accuracy and optimize clinical trial planning

Intelligent Clinical Suite
Brings all study stakeholders together to optimize data collection, analysis, and collaboration

StudyGage
Enhances patient burden analysis by integrating patient perspectives with traditional feasibility assessment

Digital tool

AI Medical Writing
Creates, reviews, and optimizes clinical and regulatory documents quickly and accurately

Digital platform

Modern Data Platform
Seamless access to governed data, data operations, and advanced analytics

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